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# THE South African MINING JOURNAL

WITH WHICH IS INCORPORATED

The South African Mines, Commerce & Industries

ESTABLISHED 1891

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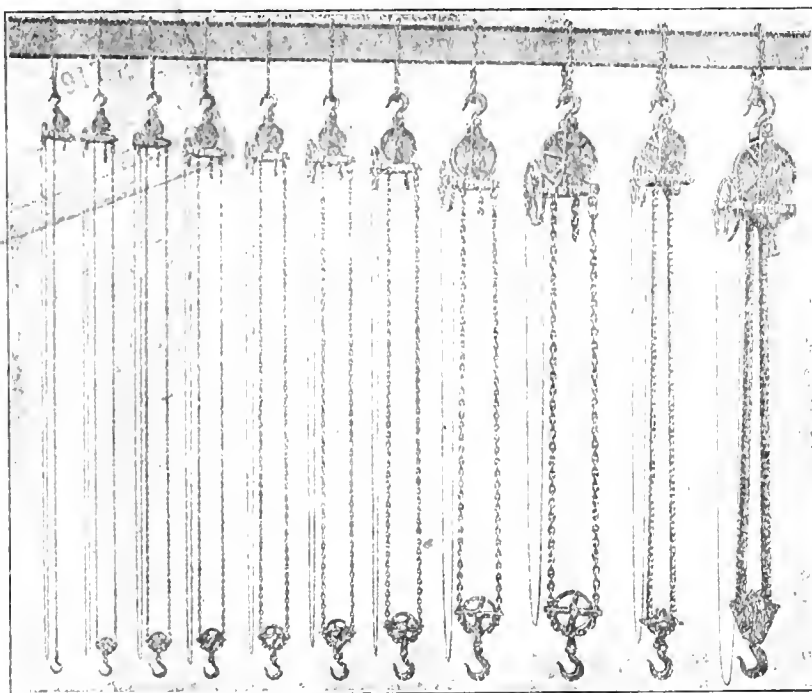
VOL. XXVI., PART I. No. 1320.] THE SOUTH AFRICAN MINING JOURNAL. JAN. 13, 1917. [WEEKLY, PRICE 6d

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Johannesburg, 27th November, 1916

Johannesburg, 14th November, 1916.



Ferreira Deep, Limited.—continued.

Working Expenditure and Revenue Account for the Year ended 30th September, 1916.

DR.		CR.	
To Working Expenditure at Mine—		By Gold Account ... ..	£1,130,227 5 8
White wages ... ..	£191,974 14 9		
Coloured wages ... ..	132,007 12 0		
Stores and Materials ... ..	222,315 11 3		
All other costs, including purchase of power, native recruiting fees, sanitation charges, insurance premiums, Miners' Phthisis Insurance Fund assessment, Rand Water Board fixed charges, work carried on by outside contractors, etc. ... ..	108,985 3 1		
	655,233 1 1		
Less Cost of Treatment Accumulated Slimes ... ..	1,178 19 5		
	£654 104 1 8		
„ General Expenses—			
Head Office—			
Salaries, agency fees, and rents ... ..	9,836 19 6		
Stationery, printing, advertising, postages, and telegrams ... ..	1,493 2 7		
Directors' and Auditors' fees ... ..	2,475 0 0		
Licenses ... ..	2,485 5 0		
Sundry ... ..	1,137 18 1		
	17,428 5 2		
	£671,532 6 10		
„ Credit Balance on Working for the year carried down ... ..	458,694 18 10		
	£1,130,227 5 8		£1,130,227 5 8
To Donations and Contributions to War Relief Funds, etc. ... ..	£1,344 6 1		
„ Miners' Phthisis Acts—			
Assessments in respect of Compensation Fund ... ..	7,284 5 3		
	£8,628 11 4		
„ Transvaal Government 3 per cent. Stock—			
Amount written off to bring down book value to market value ... ..	13,350 0 0		
„ Credit Balance carried to Appropriation Account ... ..	452,699 7 10		
	£474,677 19 2		
		By Balance brought down ... ..	£458,694 18 10
		„ Profit on Treatment of Accumulated Slimes ... ..	£1,030 19 3
		„ Freehold Revenue ... ..	1,284 10 10
		„ Interest and Exchange ... ..	7,139 12 5
		„ Sundry Revenue ... ..	6,527 17 10
			15,983 0 4
			£474,677 19 2

Appropriation Account.

DR.		CR.	
To Government Taxes—		By Balance Unappropriated—	
Union of South Africa—		As per Balance Sheet, 30th September, 1915 ...	£106,913 2 10
Tax on profits ... ..	£39,696 6 0	„ Balance of Working Expenditure and Revenue Account—	
Special War Levy—		For the year ended 30th September, 1916 ... ..	452,699 7 10
Adjustment, 1st Levy £1,216 7 10		„ Forfeited Dividends Account—	
Estimated, 2nd Levy £20,800 0 0		Dividends unclaimed for a period of five years, forfeited in terms of Clause 127 of the Articles of Association ... ..	33 13 1
	22,016 7 10		
Income Tax ... ..	235 18 3		
	£61,948 12 1		
English Income Tax ... ..	485 18 3		
„ Dividend Account—			
Interim Dividend No. 27 of 22½ per cent., declared 21st March, 1916 ... ..	220,500 0 0		
Interim Dividend No. 28 of 16¼ per cent., declared 18th September, 1916 ... ..	159,250 0 0		
„ Balance Unappropriated—			
Carried to Balance Sheet ... ..	379,750 0 0		
	117,461 13 5		
	£559,646 3 9		£559,646 3 9

RAND MINES, LTD., Secretaries.

S. C. STEIL, Secretary.

H. C. BOYD, Chairman.  
J. MUNRO, Director.

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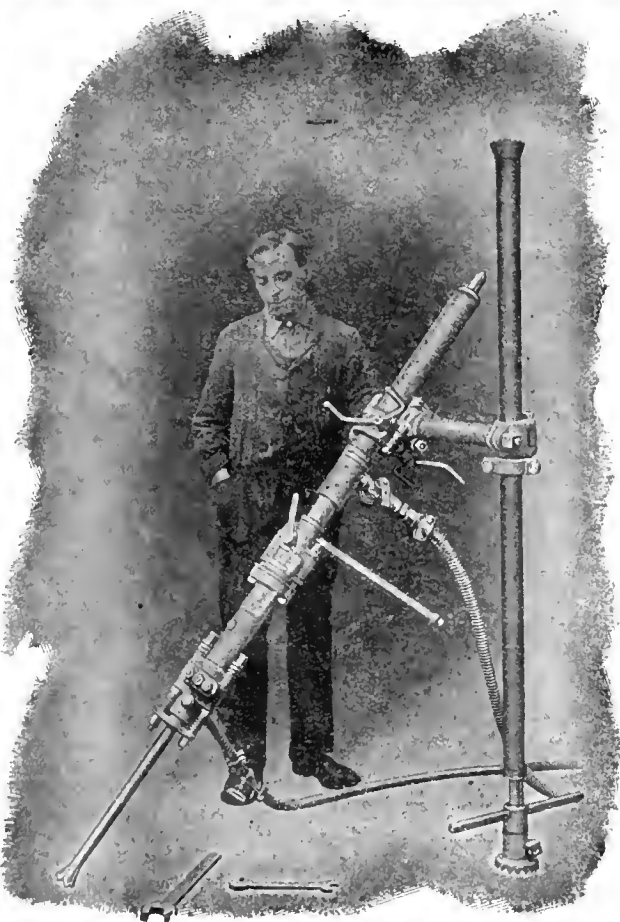
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## Notes and News.

Much interest is being taken in the recent developments in the Nigel district, owing doubtless to the publicity given to the improving returns from the Sub Nigel. The drilling plant has now arrived on the farm Spaarwater No. 1, and boring will be continued on that farm in the course of the next week. Following upon this, boring will also be started on Spaarwater No. 2, and thereafter on Spaarwater No. 3. It will be remembered that the farm Spaarwater lies in the immediate dip of the Sub Nigel, and is believed to be a sub-outcrop proposition at anything from 1,500 to 2,000 feet. The farms are separate entities in one contiguous block, and to the south-east immediately adjoin the property of the Sub Nigel. Grootfontein No. 152, the property of the Consolidated Goldfields adjoins the farm on the north-east, and on the western boundary lies Vlakfontein No. 65, the property of the East Rand Mining Estates. Should successful results be obtained from the boring on Spaarwater, it will bring into the Far Eastern Rand basin an area of 12,106 acres, equal to 8,262 claims, to be dealt with. On the further extension south and east, to which we referred in our last issue, drilling is to proceed immediately in order to prove the farms Eendracht and Kopjeskraal, the properties of the Oceana Development Company. Throughout the whole of the district new life would seem to have been instilled, and it is certain that the Nigel and Heidelberg areas are going to have another big "innings."

\* \* \* \*

The annual general meeting of the S.A. Institute of Electrical Engineers will be held next Thursday evening, when an interesting valedictory address may be expected from Prof. Buchanan, the retiring President. An interesting item in the proceedings will be an exhibition of objects of historical electrical interest. The balance sheet of the Institute, to be laid before the meeting, will contain one notable feature. Of the reserve fund of eight hundred odd pounds, no less than a round sum of £800 has been invested in the British War Loan—surely an excellent example to other public bodies.

\* \* \* \*

A correspondent favours us with a copy of the prospectus of the New Ophir G.M. Co., Ltd., a Capetown flotation, fathered by Mr. C. A. C.M. Co., Ltd. Lageson. The capital of the company is £30,000, and the directors are now issuing 50 debentures of £100 each, bearing interest at 10 per cent. The company has been formed to acquire 149 claims on the farm Uitkyk, Kaapsche Hoop, Godwan River Station, Eastern Transvaal. These claims have been developed by the discoverer, Mr. A. G. R. Myburg, and they have been reported on very glowingly by Mr. F. Brorson, who is described as a "Mine Manager," and who writes vaguely of a "large blue reef." The estimates in the prospectus appear to be mere guesses, and we cannot advise our Cape Colony friends to risk their money in the venture.

\* \* \* \*

The November returns of the Chamber of Mines show that 2,389,056 tons were milled during the month on the Witwatersrand, and **The Chamber of Mines' Returns.** £3,212,854 worth of gold were produced, or at the rate of 26s. 9d. per ton milled. Working costs averaged 18s. 2d. and profits 8s. 2d. per ton milled. In outside districts 52,399 tons milled yielded £113,399 worth of gold, or at the rate of 35s. 1d. per ton, the costs averaging 26s. 2d. and profits 9s. 10d. per ton milled. Owing to the steps taken by the industry to regulate and ensure the supply of stores and labour, the winning of gold has been carried on with a uniformity and vigour that does great credit to all concerned. It will be observed, however, that the increased output during the past year,

while dependant to some extent upon the quantity of ore crushed, has been largely due to the higher recovery, following, no doubt, upon a higher average grade of ore milled. Working costs have risen slightly, and to a smaller extent so have working profits. The great influence and expansion of the East Rand is easily to be seen by anyone who has time to go into the Chamber of Mines' figures in detail. A notable feature, in considering the increased grade milled, is the decreasing percentage of sorting, connoting, also, a higher grade of ore mined.

Although the working of the Government Reef in the immediate vicinity of Witpoortje Station, the Penwith Block, and various localities elsewhere has not yet given very encouraging results, it appears that still another attempt is to be made upon it. The scene of the new undertaking is adjacent to a road which leads northwards from the village of Luipaards Vlei, only a few hundred yards from the station. Here the first portion of a small digger's plant has been off-loaded, and the owner, who is reported to hail from the Barberton district, has already begun to erect some quarters.

By the mail last to hand, advice has been received that Mr. H. B. Marshall, who founded the South African and General Investment and Trust Company, Ltd., in 1895, and has since filled the position of Chairman of the concern, has resigned that office, and that Mr. Robert Littlejohn has been appointed to the Chair. Mr. Littlejohn has been a director of the Trust Company for many years and is well known in South African circles, having been General Manager of the African Banking Corporation, Ltd., from the inauguration of that concern until the time of the Boer War, when he joined the board of the bank in London. Mr. Littlejohn is now Deputy Chairman of the African Banking Corporation, as well as being interested in the direction of various other financial concerns controlled in London. Mr. H. B. Marshall retains his seat on the board of the Trust Company and his active interest in the direction of its affairs.

The Zaaiplaats results for the month of December, 1916, are as follows:—Days run, 17; ore milled, 1,110 short tons; residues re-treated, nil; concentrates won, 18 long tons; average value of concentrates, 70 per cent. M.T.; estimated loss for the month, excluding Government taxes on profits, £1,160 8s. 6d.; deduct adjustments in respect of estimated values of previous shipments, £61 15s. 8d.; loss declared for the month, £1,098 12s. 10d.; capital expenditure, nil. Revenue for the month has been calculated on the basis of tin at £171 per ton. The mill was shut down for 11 days during the month. Shortage of native labour, which always occurs at this time of the year, has also adversely affected the output. Development continues satisfactorily.

The report of operations for the quarter ended 31st December, 1916, is as follows:—Stamps, 17 Leeuwoort Tin. (including 2 Nissen); time run, 8435 days; tons crushed, 12,828 short tons; concentrates won, 242 long tons. The average assay value of concentrates is 61.21 per cent. metallic tin. The average price of metallic tin on which the quarter's revenue has been determined is £175 5s. per ton. Estimated profit, £3,851 18s. 6d.; adjustments in respect of previous shipments, £904 3s. 5d.; profit declared for quarter, £4,756 1s. 11d. The sum of £183 9s. 8d. has been expended for new tin dressing plant, machinery, buildings, shaft sinking, etc. During the quarter a sum of £3,207 for development redemption has been included in working costs.

In the course of an extraordinary attack on Rand methods, a writer in the *San Francisco Mining and Scientific Press* hits out against everything connected with the present control and technical management of the industry. Flashes of commonsense, however, illumine this drab

recital of Rand shortcomings. For instance, the following is not without a basis of fact: "The observant visitor agrees with the enlightened Boer that the best results are not being obtained from the Kaffir, because his capacity is restricted arbitrarily by an artificial barrier. For example, the native is not permitted to use an explosive, to serve as station or skip-tender, or to handle a winch in which men are raised and lowered. In other mining districts such tasks are performed safely by Koreans, Mexican Indians, and negroes of every shade. The white-labour union is allowed to dominate the economic conditions; the native is not permitted to advance according to the proof of his intelligence nor is he accorded full scope for the ability developed by training. The white man plays the part of an expensive supervisor. The economic waste is undeniable. Pay in proportion to efficiency would promote skill and the raising of wages would increase the wants of the native so as to prompt him to remain at work. These are observations established by experience in every part of the world where the indigenous population has been harnessed to industry. Just now there is an abundant supply of native labour on the Rand and it is being used lavishly under a diminished white supervision. In this and other matters the mines suffer from politics. Several of the leading operators are prominent in parliamentary affairs, in opposition to a violent Labour party, creating bitter antagonisms not at all good for the welfare of the South African Union." Where this critic goes sadly off the track is in blaming the mines for mis-handling the native question! Our critic in a hurry might have gone a little more deeply into the question before rushing into print.

On 26th October, 1915, after elaborate preliminary preparations, the hearing of the now famous case of the Amalgamated Properties of Rhodesia (1913), Ltd., against the Globe and Phoenix Gold Mining Company was started. A year later, Mr. Justice Eve delivered his judgment, and the Globe Company scored a sweeping victory on all counts. The case lasted 144 days, the final 45 of which were taken up by the remarkable speech of Mr. Upjohn, K.C., for the defendants. A period of three months has been granted in which to lodge an appeal. We cannot hope to print the wonderfully clear analysis which Mr. Justice Eve gave of a labyrinth of mining technicalities which he threaded as confidently as if he had spent his best days underground instead of on the Bench. The evidence, he observed, might be summarised under three heads—the prehistoric, the contemporary and the retrospective. But, taking it all in all, the Judge evidently thought that it was a case where possession meant nine points of the law, and that where a company, as the Globe and Phoenix had done, had worked its mine for twenty years, the onus lay on the plaintiffs to prove that the defendants' interpretation of the reef structure was radically wrong. Mr. Justice Eve dismissed the contention that the agreement for the sale of the "John Bull" claims involved any waiving of the Globe and Phoenix Company's right under Rhodesian law to pursue its reef on the dip to an indefinite depth. The construction of the agreement having been decided in favour of the defendants "the burden was cast on the plaintiffs to prove that the defendants had worked minerals in which the plaintiffs' predecessors had an interest." "They had failed," and his Lordship had, therefore, really nothing further to decide. Assuming that the case does not go to appeal, some £170,000 (or 4s. per share), which the Globe and Phoenix has accumulated as a reserve against the result of the litigation, will be released. On the other hand, the hopes of hundreds of thousands of pounds damages with which holders of Amalgamated Properties have been buoyed up are at an end. Not only that, but the company's own funds are exhausted, and the payment of the enormous costs of the action will leave it heavily in debt. These facts explain the sensational contrary movements in the shares of the two companies. The numerous small shareholders among the 14,000 members of the Amalgamated Properties Company are deserving of sympathy.

## TOPICS OF THE WEEK.

### MORE STATE MINES WANTED.

THE excellent terms secured by the Government for the mining areas recently put up to tender on the Far East Rand will, it is hoped, encourage it to turn to good account the rest of the mining ground lying fallow in the same district. The comparative plethora of offers for the areas lately disposed of may be set down as attributable to three factors: (1) The realization, due to the war, of the need for accelerated gold production; (2) the unique advertisement enjoyed of late by the improved prospects of the Far East Rand; and (3) the accumulation—due also to the war—of capital seeking a safe and profitable field of employment, removed from the area of actual conflict. It will be seen that at least two of these factors are bound up with the war; and the Union Government will be well-advised to recognise and act upon the fact. It is demonstrable, for instance, that the need for a large and accelerated gold output from the Rand may be less insistent when peace comes. Again, it is a truism that the competition for capital, when peace makes possible the rehabilitation of the stricken nations of Europe, will operate seriously to diminish our chances of attracting what we may require for the then less pressing needs of gold mining. For these two reasons, not to mention others, it is advisable that the Union Government should lose no time in dealing with the other potential gold mines of the Far East Rand. The reasons given do not, of course, exhaust the list. If capital moves slowly, engineers likewise require time to mature their plans; and, as we all know, the preliminary processes of making a mine—shaft-sinking and development, to wit—are lengthy and tedious. After the war increased revenue will be wanted, and an enlarged field of employment, and new mines to replace those now quickly becoming exhausted. To meet all these needs it is essential that a beginning be made, and advantage taken of the unique monetary conditions of the moment to secure the necessary capital. It has to be admitted, of course, that at present labour is none too plentiful; that machinery and supplies are expensive and difficult to obtain; and that effort may, conceivably, be more directly exerted towards the end of winning the war than by opening new mines. The point is, however, that the moment should be seized to secure the co-operation of that shy bird, Capital; and that once its undertaking to develop the areas in question is obtained, there is no need to press matters further until conditions in other respects are relaxed by the successful termination of the war. It is not too much to say that the credit of the Government and of the country has been substantially strengthened by the successful outcome of the recent offer of Far East areas; and nothing but good can, therefore, result from following that excellent lead. Opportunity often knocks but once. The comparative stability of the mining industry of the Rand in the face of an unprecedented world-war has given it an unexampled advertisement in the eyes of investors. The conditions that created that attractiveness may, however, pass as quickly as they have come. The Government has, therefore, everything to gain by following up its recent success in the money market and turning to the best and earliest advantage an opportunity that may never come again!

### WAGES ON THE MINES.

THE fact that a Government Departmental Committee is now inquiring into the question of white wages on the mines of the Rand has come as a surprise to people who had considered the question settled by the abolition of the flat contract system. The terms of reference to the Committee are "to report upon (a) the system of underground contracts in use on the Rand mines; (b) the question of abolishing such contracts, by statute or otherwise, or of substituting an amended system." When all the groups, excepting the Robinson, agreed as from June 1, 1915, to abolish the "flat contract system," in accordance with the recommendations of the Economic Commission and Dominions Royal Commission, it was hoped that the matter had been finally disposed of; but, apparently that view has

for some reasons not been justified. These reasons seem to be (1) that the day's pay plus bonus which has replaced the flat contract system has, in practice, resolved itself into something differing little in effect from what has been superseded; and (2) that it is impossible to carry out the intention to abolish the contract system as long as any mines fail to act up to the letter and the spirit of the agreement. As a consequence the whole question is now being re-opened. Some two years ago, it may be remembered, the Mines Department made a determined effort to abolish the contract system on the mines of the Rand. The Department, with the strong support of the Miners' Union, got hold of the idea that to the old system was attributable much of the disease and accidents on the mines. Previous to that, about eight years ago, after the first strike, the whole question of the miners' pay was very fully threshed out in our columns and elsewhere, but the contract system, though condemned in many quarters, and temporarily abandoned by several mines in favour of the day's pay plus bonus system, finally and gradually won the day. With the State regulation of contracts embodied in the Mining Regulations of 1912, whereby an improved and stereotyped form of contract was introduced, the old system obtained a new lease of life, until abolished by general agreement on June 1, 1915. To-day the question is thrown back in the melting-pot; and if we are to regard the present day's pay plus bonus system as equivalent to the old contract system in disguise, many of the arguments used against the latter may be applicable. These arguments have been well expressed by some medical men, labour leaders, and other reformers. For instance, the Minority Report of the New Zealand Mines Commission contained a strong condemnation of the contract system, from which the labour people on the Rand doubtless took their cue. *Inter alia*, that report said:—All the witnesses on behalf of the workmen admitted before the Commission that the contract work and night shift were responsible for bad health and the major portion of the accidents, notwithstanding that their earnings are a little larger under the contract system than under the day-wage system. Knowing, as the miner does, that his occupation is hazardous, dangerous and unhealthy, in order to launch out in some other avenue of employment, he endeavours to try and make a big cheque, and takes full advantage of the time spent underground to accomplish the object in view. Dr. Conlon, in giving evidence before the Commission, said: "The contractors are the men who suffer most; the good miners always go under quicker." In answer to a question by the Chairman on the subject, he further stated that the more the men exerted themselves the more likely they were to get the disease, and "the men who worked hard frequently go away from the district because their health is affected. A man cannot work underground and extend himself as he can on the surface. If you look through a list of the men who have suffered from the disease you will find that they are the men who worked as contractors." Continuing his evidence, in reply to a Commissioner, he said that the work lowers a man's vitality, and he runs into places without waiting for the dust to settle, thus taking bigger risks; further, that the average age of men dying in the Reef-ton district, during a period of twelve years and a half, would probably work out at fifty-five. Dr. Thomas Oliver, F.R.C.P., in his work on "Diseases of Occupation," quotes Dr. H. Brembridge, who is on the medical staff of the Kolar Goldfield, India, as follows:—

In the Kolar gold mines there are 40,000 coolies employed; the rock is hard. Dr. Brembridge went to India expecting to meet with miners' phthisis, but failed to find evidence of the disease except in men who came from the Transvaal. He found that the native and white men kept good health. He attributes the freedom from miners' phthisis partly to the fact that the men take more leisure, and are not so eager to make a fortune as the miners in the Transvaal.

Dr. Oliver also says: The miners on the Rand are paid for piece-work; they are impatient, and as they prefer to run risks some persons may say the mines are not altogether to blame. They rush back too soon after blasting to recommence work in the particular part of the mine, the air of which contains a slight excess of CO<sub>2</sub> when the explosion has been complete, and always a large quantity of dust. They neither allow the smoke to clear away nor the dust to settle.

How far these criticisms apply to the present system on the Rand, and what, if any, benefits may be credited to the contract principle, are points which will be considered at some length in our next issue.



## THE RIETFontein SERIES REDIVIVUS.

### An Outstanding Geological Problem—Renewed Activity on Promise Reef—Some Unpublished Information Required.

THE discontinuance of the work of the Geological Survey on the Witwatersrand system, extensive and long continued though it has been, has unfortunately left large areas, where geological problems of importance are still awaiting solution. The farther parts of the Heidelberg region, for example, towards Hex River, cover a stretch of auriferous ground which would doubtless well repay an enquiry similar to that which has been carried out by the Mines Department in other parts of the Witwatersrand. Still more profitable, perhaps, would be a detailed geological investigation of the Klerksdorp field, while the possibilities of districts still more remote do not appear unworthy of systematic examination in view of the economies that have been brought about in the mining of gold from the bankets. Apart from these more or less obvious undertakings which obtrude themselves upon the attention of the Mines Department, there is at least one other problem that calls for a solution in connection with the mapping that has already been done on the Rand. It is one that appears to have escaped attention for the moment, although it is more than likely that the renewed prospecting activity which is in progress in the neighbourhood of Witpoortje and Luipaards Vlei will again drag it into the light of day. The problem referred to is that concerning the position of the Rietfontein series in the geological sequence of the Witwatersrand, and the processes by means of which it has been brought into its existing surroundings. Since the investigation of the Witwatersrand system was taken in hand by the Geological Survey no question has been so warmly argued, and the fact that it has been allowed to disappear so completely, although as yet quite unsettled, from the field of scientific discussion, is one of the most remarkable circumstances associated with the work of the department.

#### SOME EARLIER VIEWS.

Although it occurred as far back as five years ago, the contribution of Mr. C. Baring Horwood to the discussion of Dr. Mellor's papers on the Witwatersrand system, at a meeting of the Geological Society of South Africa, is doubtless well remembered by those who were present on the occasion referred to. Subsequent additions to the discussion by Mr. W. Bleloch and others served to emphasize the importance of the subject. The geology of Langerman's Kop and Rietfontein was the matter around which most of the debate ebbed and flowed during several meetings, with the result that opinions remained pretty much as they were when the discussion began, except that Dr. Mellor's views were apparently in the ascendant. In the summary at the end of his paper on "Some Structural Features of the Witwatersrand System," Dr. Mellor gave his opinion concisely as follows:—"The Rietfontein series is found to be outside the outcrop of the Witwatersrand formation and to the north of the Orange Grove quartzites, and both the Rietfontein series and the Langerman's Kop beds are seen to be related, not to any particular horizon of the Lower Witwatersrand system, but to the line of faulting referred to (the Bezuidenhout Valley fault). With regard to the relationships of the Rietfontein series and Langerman's Kop beds, the author is in agreement with the opinion already held by many geologists that these belong to a formation unconformable to the Witwatersrand system." Mr. Baring Horwood drew attention to the fact that the late Dr. Carriek, who had studied the geology of the Rand very assiduously and carefully, had correlated the Rietfontein series with the Promise series of the West Rand and the Bertha Estate series of the Far South-West, and in an endeavour to support this correlation entered upon a line of argument which was unnecessarily involved and

not in accordance with facts which had been established fairly conclusively by Dr. Mellor's survey. A simpler theory might have been proposed which, while being sufficiently forceful, would have been consistent with all the available field evidence. As showing the conclusions of the Survey with regard to the Rietfontein series, which was placed in the category of "rocks later than the Witwatersrand system," the following statements of Dr. Mellor may be selected. "While it will be clear to anyone reading the brief description of the Rietfontein series given in my first paper that I am fully of opinion that there is still much to be learnt about it, there is one point, at least, on which all the available evidence is very strong, and that is that the Rietfontein series is not interbedded in the Lower Witwatersrand system." And again: "Personally, I feel sure that had Dr. Carriek had the opportunity of examining the evidence which has since become available he would most probably have formed a different opinion. The evidence that the horizon of the Promise Reef, which is above the Hospital Hill quartzites, lies far south of the Du Preez Reef at Rietfontein, is so very strong that probably the majority of those who examine that section in detail will find very great difficulty in accepting any other conclusion." Finally, in reply to Mr. Olver's correlation of the Rietfontein series with the Main Reef series, which lies a good deal further to the south of the Du Preez Reef than does the Promise series:—"I see no great improbability, however, in the view advocated by Mr. Olver that the Rietfontein area may include (among other elements) a faulted portion of the Main Reef series. At the same time I certainly see no striking similarity between the Rietfontein reefs and the nearest occurrences of the Main Reef series, and especially between the South Rietfontein reefs and the Bird reefs, which Mr. Olver makes a strong point in his correlation." The position of the Rietfontein reefs in the geological sequence, then, as may be seen from the voluminous discussion which has been printed in the Transactions of the Geological Society of South Africa was the one point which was most disputed, and the firm conviction of the Survey as expressed in reports and other papers, and on detailed maps, was that the series could not be included in the Witwatersrand system at all. There the matter ended, for the time. It was naturally anticipated by all concerned that the question would be more fully taken up by the Survey when the opportunity was afforded to deal with it more completely in conjunction with the adjacent areas, a thorough study of which was considered essential by Dr. Mellor.

#### THE PRESENT POSITION.

Since the papers above referred to were published a more extended and detailed study of the question has doubtless been made. Beyond a few unmistakable indications that the view of the Survey has been modified, if not altogether changed, as a result of these enquiries, no statement has been made by the department which would serve to throw a light upon this very important question. For example, in the map of the Eastern Witwatersrand which accompanied the very interesting paper upon that district which was read by Dr. Mellor before the Geological Society of South Africa, the Rietfontein series is indicated by hatching, which is used to define the Upper Witwatersrand system. No reference to this alteration whatever appears in the paper nor in any discussion upon it, as far as we are aware, doubtless because the Rietfontein area is not properly included within the ground which is more particularly covered by it. A recent allusion was made to the matter, however, by Mr. W. Bleloch, at a sitting of the Select Committee on East Rand Gold Areas. He said, *inter alia*:—"In the course of an arbitration which took place last year, and which is referred to in my statement, where I was one of the arbitra-



tors and Dr. Mellor was one of the witnesses, a question was asked Dr. Mellor by the solicitor for the plaintiff, who was a claim-holder holding claims on the farm Vlakfontein. The question was, 'What is the Rietfontein reef, Dr. Mellor?' and Dr. Mellor replied, after a little hesitation, that in his opinion the Rietfontein reef belonged to the Main Reef series." Taken in conjunction with the evidence of the map above mentioned, this statement, which has not been contradicted, proves very clearly that Dr. Mellor has gone more fully into the question, and has accumulated data which throw quite a new light upon it. The correlation of the Rietfontein series with the Main Reef series, in view of the great want of similarity between the two groups of rocks

involves a line of geological thought that must be extremely subtle and very technical, and must obviously, therefore, be unusually interesting. That it is of some economic importance, also, is proved by the many resemblances which exist between the Promise series and the Rietfontein series, even to the presence of a rich, narrow, but somewhat elusive, leader which shows a large amount of visible gold wherever prospectors have managed to pick it up. It is not too much to ask, therefore, in the interests of scientific enquiry and mining progress, that the Mines Department should use the Geological Society of South Africa as a medium whereby Dr. Mellor's more recent investigations upon the subject may be made public.

### New Patents.

312. Heine Wolf Adler and Charles Berton Simonsen.—Watering nozzle and valve.
313. Henry Alfred John McLellan.—Electrically driven gramophone motor with complete speed regulating device.
314. Allan Groundwater.—Improvements in hammer drills.
315. Henry Thomas Hall.—Hay, or the like, collector.
316. Alfred William Knight.—Improvements in the manufacture of horse-shoe nails.
317. Richard Dickson Ewart and George Purvis Russell Balfour Kinnear.—Improvements in priming devices for use in starting internal combustion engines.
318. Alfred Thomas Harris and Charles Alexander Grant.—Improved cock for air, gas or liquid.
319. Karl Baumann and the British Westinghouse Electric and Manufacturing Co., Ltd.—Improvements in or relating to steam turbines.
- 320.—Karl Baumann and the British Westinghouse Electric and Manufacturing Co.—Improvements in or relating to feed water heaters.

### Anglo-French Matabeleland.

The report to May 31, 1916, states that the profit and loss account for the year shows a loss of £1,481, which, deducted from £5,858 brought in, leaves £4,377 to credit of the account. The accounts were adversely affected, mainly by the closing down of operations on the D. and C. mine and by the non-payment of instalments due on the sales of land, which the directors have agreed to postpone on account of prevailing conditions. The available cash, including the company's holding in Treasury bills, less sundry creditors, amounts to approximately £21,248. During the year 67 mining claims were abandoned. None of the D. and C. claims were worked, but the manager is hopeful of being able to relet the property as soon as conditions become more settled and it is possible to obtain the necessary mining supplies at a reasonable cost. The manager in Rhodesia states that the cattle-ranching continues to be successful on the Belingwe block. An independent valuation based on the prices realised from sales of similar cattle at the Gwelo Auction Mart made on April 2 last, gives a total value of £12,956, which compares with £9,751 at May 31, 1915. It is anticipated that sales of stock from the ranch will commence during the coming year.

### New Company Registered in London.

PIETERSBURG SYNDICATE, LTD.—This company was registered on November 23, with a capital of £6,875 in 5,000 preference and participating shares of £1 each and 75,000 ordinary shares of 6d. each, to carry on the business of promoters, property owners, concessionaires, etc. Private company. The number of directors is not to be less than two nor more than six. The subscribers are to appoint the first. Remuneration as fixed by the company. Secretary, J. Eustace. Registered office, 62 London Wall, London, E.C.

## The Cassel Coal Co., Ltd.

(Incorporated in the Transvaal.)

### Notice to Shareholders.

NOTICE IS HEREBY GIVEN that the Nineteenth Ordinary General Meeting of Shareholders in the above Company will be held on **Tuesday, the 27th day of March, 1917, at 11.15 a.m.**, in the Board Room, Lace Building, Johannesburg, for the following purposes:—

1. To receive and consider the Balance Sheet, Profit and Loss Accounts, and Directors and Auditors' Reports for the year ended 31st December, 1916.
2. To elect two Directors in place of Messrs. J. H. Ryan and W. Ross, who retire in rotation, but, being eligible offer themselves for re-election.
3. To appoint Auditors for the ensuing year, and to fix the remuneration of the Auditors for their past services.
4. General Business.

The Transfer Books of the Company will be closed from the 20th to the 27th March, 1917, both days inclusive.

By Order of the Board,

T. L. DAY, Secretary.

Lace Building, 74, Fox Street,  
Johannesburg, 9th January, 1917.

# ALFRED F. ROBINSON, LTD.,

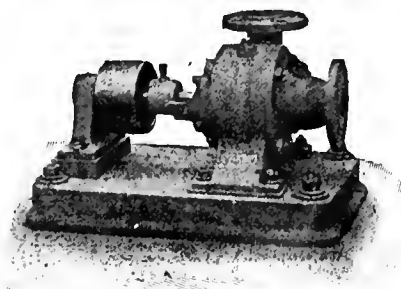
17/19 & 22, Southern Life Buildings, JOHANNESBURG.

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'Phone No. 3516.

Telegrams: "ALPHA."



## FERREIRA DEEP CONSULTING ENGINEER'S AND MANAGER'S REPORTS.

### Detailed Review of the Year's Operations.

In his report on the general operations of the Ferreira Deep for the year ended September 30, 1916, the consulting engineer, Mr. Percy Cazalet, writes:—The scale of operations has shown an appreciable increase over that of the preceding year, due to the more regular hoisting which was possible through the Deep shafts; there having been no really serious collapse in either shaft during the year, such as took place in No. 2 Incline during the financial year 1914-15. Severe earth tremors continue, however, to be felt on the mine, and in several instances sections of the workings have collapsed, including several minor falls in No. 2 Incline, but the effect of these has been only local and has interfered but little with the output of the mine. The stopes continue to respond well to the method of support employed therein and no cases of lost stopes have occurred, although isolated falls and pressure bursts have taken place. The tonnage of broken reef packed in the stopes and utilised for their support amounted at the end of the year to some 202,000 tons; 141,629 tons having been packed and 134,104 tons withdrawn from packs during the 12 months. The figures of ore packed in the mine can be accepted as a conservative estimate. No. 1 Shaft has recently shown further signs of strain as the weight experienced travelled eastwards across the mine, with the result that it has been decided to remove all the South Reef, irrespective of value, overlying this shaft in its lower levels. Higher up where the shaft is cut in the formation above the reef bodies, one or other of these is being cautiously mined below the shaft and will be refilled with sand. As an additional precaution a footwall crosscut on the plane of the 7th level is being advanced to connect No. 1 Incline with the newly-deepened No. 2 vertical shaft. The No. 2 shaft reorganisation work, reported as in hand last year, has been practically completed, the new portion of the shaft being almost ready to be put to use, with the exception of the electric gear for the underground hoist, which has not yet been shipped from England, owing to delays due to the war. All expenditure in connection with this work, which has amounted to more than originally estimated, has been met out of working costs during the year under review. The hoisting of ore in the outcrop shaft was discontinued last December and this shaft is now only employed for assisting in handling the shifts of workmen. The working costs show an increase of 1s. 3d. per ton when compared with the previous year, the major portion of which increase is due to the high price of stores, to active service pay to employees, and to the cost of the No. 2 shaft re-

organisation. The yield, however, showed an increase of 11d. per ton and the working profit, after allowing for the decrease of profit from the treatment of accumulations (which are now exhausted) of £10,526, showed a total decrease of only £7,764. There was a reduction of 1,264 feet in development as compared with the previous year, while the current year may be expected to exhibit a very material further decrease, since all the main development, including that in the area south-east of the Grahamstown dyke, is now practically completed; there remains only the further prospecting of the areas in the eastern section hitherto showing low values on the Leader, to carry out. Shaft sinking is completed. Development values have continued good and ore of a higher average value has been exposed than during the previous year. The ore reserves have been re-estimated as at September 30th and now amount to the following:—Leader: Outcrop section, 29,200 tons, value, 6·7 dwts.; Deep section, 970,900 tons; value, 8·5 dwts.; South Reef: Deep section, 632,500 tons; value, 8·2 dwts.; total, 1,632,600 tons, value 8·3 dwts. The estimated stoping widths over which these reserves are based are 72 inches for Leader and 58 inches for South Reef, as compared with 73 inches and 57 inches respectively at the last revision. A reduction of 221,500 tons with a similar value, is thus shown for the year; but the reserves must be expected to show further reduction yearly, both in tonnage and value. Of the above total of 1,632,600 payable tons in reserve, 434,753 tons of a value of 8·7 dwts., consisting of shaft and boundary pillars, are not presently available for stoping, but will gradually become so during the remaining years of the mine's life. The 202,000 tons mentioned as being packed in the stopes are additional to the above-mentioned reserves. There is further some considerable tonnage of Main Reef in the footwall of the Leader stopes, of an estimated value of about 3·7 dwts., some of which may be mined when the richer ore is more nearly exhausted, especially if costs can be lowered appreciably. Stopping operations are now becoming more concentrated to the No. 1 shaft area, which is generally of much lower grade than the western half of the mine; at present some 60 per cent. of the ore mined is being hoisted at No. 1 shaft. The result of this must be a lowering of the average grade of ore mined in the future, but some reduction in cost is hoped for as a partial offset to this while the present scale of operations can be maintained.

*Inter alia*, the manager writes:—Stoping was carried on throughout the mine, resulting in a total of 710,125 tons, to which must be added the ore obtained from developing faces, making a total of 745,630 tons mined, of which 2,509 tons were from the Main Reef, 355,716 tons (48 per cent.) were from the Leader, and 387,405 tons (52 per cent.) were from the South Reef. The stoping widths in these reefs averaged respectively 21 inches, 75 inches and 57 inches. The development operations resulted in the following footages: Drives, 2,519 feet; winzes, raises and crosscut raises, 4,108 feet; crosscuts, 1,957 feet; incline shafts, 89 feet; vertical shafts, 610 feet; total, 9,283 feet. No. 1 (Deep) incline shaft was deepened a further 89 feet, making its total depth from the vertical shaft 2,986 feet, or 124 feet below the 15th level. No. 2 (Deep) vertical shaft was deepened 610 feet to 127 feet below the 7th level, reaching a total depth from the surface of 1,840 feet. Of the above footage 3,384 feet, or about 36 per cent., was in reef formation, the reef disclosures in which were as follows:—Main Reef: Distance exposed, 86 feet; width, 20 inches; assay value, 12 dwts. Leader: Distance exposed, 2,171 feet; width, 22 inches; assay value, 17 dwts. South Reef: Distance exposed, 1,127 feet; width, 14 inches; assay value, 19 dwts. The estimated tonnage of payable ore developed was as follows: Leader, 178,393 tons; South Reef, 135,870 tons; total, 314,263

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tens. The practice of supporting the hanging wall in the stopes by means of reef packs was considerably extended as the weight of the superincumbent strata increased, with satisfactory results—the tonnage packed being 141,629 tons as compared with 98,366 tons for the previous financial year. These tonnages, when reduced to areas packed and compared with areas stoped, show that for the year under review 42½ per cent. of the area stoped was covered by reef packs as compared with nearly 34 per cent. for the previous financial year. These tonnages, when reduced to areas packed and compared with areas stoped, show that for the year under review 42½ per cent. of the area stoped was covered by reef packs as compared with nearly 34 per cent. for the previous financial year—the percentage for September, 1916, being as high as 61½ per cent., indicating the likely necessity of further increasing the packing during the current year. While the above packing was in progress the recovery of packs previously used for hanging support was also on the increase, the tonnage procured from this source being 134,104 tons as compared with 81,453 tons for the previous financial year. During the recovery of the above-mentioned packs a systematic scraping and washing of footwalls of the stopes as well as the extraction of any reef pillars encountered has been in progress. This work has accounted for a very large proportion of the ore obtained from sundry sources during the year, which amounted to 130,866 tons of 5·9 dwts.; if it had not been for the support given by reef packs, much of this tonnage would have been lost beyond recovery. The work in connection with the reorganisation of the winding arrangements at No. 2 shaft proceeded at full speed until it was known that the electrical equipment would be delayed, owing to the war, when the work progressed at a

much slower rate; barring unforeseen accidents, the change over should take place as soon as the electrical equipment arrives. In order to compensate for the loss in tonnage at the time of the change over, a considerable accumulation of sorted ore was tipped on surface during the year while native labour was plentiful. This dump can be drawn upon during the period of change over and should be sufficient to balance any loss of tonnage due to temporary suspension of winding operations. The tonnage hoisted through the Outcrop shaft fell from 48,718 tons to 1,469 tons. A considerable tonnage still remains in the pillar behind the shaft, which will be extracted when it proves possible to abandon this shaft entirely. No. 1 (east) shaft is now equipped for handling larger tonnages and the current year's working should show a marked increase in the percentage of ore from the lower grade eastern area. Development operations for the year continued much as usual, the total footage accomplished being 9,283 feet, as compared with 10,547 feet for the previous year. Shaft sinking can now be regarded as having been completed and the development footage will in future be considerably reduced. The yield per ton milled averaged 8·448 dwts., or 0·189 dwt. higher than for the previous year; the difference is practically accounted for by an increase in the percentage sorted of 3·3 per cent. Working costs averaged 20s. 11d. for the year, or 1s. 3d. more than during the previous year; the bulk of this increase can be accounted for by increased active service allowance and extraordinary expenditure, increased sorting and extra cost of stores due to the war being responsible for the balance. The average number of natives working during the year was 4,021 as compared with 3,495 for the previous year. The machinery and plant have been kept in thorough repair.

## PERSONAL.

Mr. G. H. Beatty, Assistant Consulting Engineer to the Johannesburg Consolidated Investment Co., Ltd., who has been Acting Manager of the Government Gold Mines (Modderfontein), Ltd., has resumed his duties at the head office; and Mr. E. G. Sudlow has been appointed Manager of the Modder State Mines.

\* \* \* \*

Mr. B. Madew, having the intention of returning to England to engage in munition work, has resigned the position of Consulting Engineer to Messrs. A. Goerz & Co., Ltd. He is succeeded by Mr. P. M. Anderson, Manager of the Geduld, whose place is being taken by Mr. S. Macphail, who has been underground manager of that mine.

\* \* \* \*

The list of certificates issued by the Mines Department, for the month ending the 31st December, 1916, is as follows:—Mine Overseers' Certificates (Collieries): W. Banton and R. Donaldson. Mine Surveyors' Certificates: B. T. Altson (honours), J. J. Evans, A. C. Leisegang, L. A. Robertson, H. S. Stephens.

## Mozambique Macequece.

The report for the year to December 31, 1915, states that throughout the year there was no revenue from the mine, as it remained closed down. It was considered desirable, however, to continue keeping at least the upper levels free of water, to admit of their inspection by prospective tributors. The tributing agreement referred to in the last report as being in course of negotiation was not brought to a successful issue; but negotiations were afterwards re-opened and an agreement has recently been concluded. As the agreement was on similar lines to those which the shareholders have previously approved, the board did not think it in the interest of the shareholders to delay matters till the proposals could be put before them. As stated in the last report, the company appealed to the Supreme Court at Lisbon against the decision given against them by the local Appeal Court, in the action against Mr. C. Aubert, but, unfortunately, the Supreme Court has confirmed the decision of the local Appeal Court.

## ANSWERS TO CORRESPONDENTS.

*All inquiries addressed to the Editor must bear the writer's name and full address. We cannot reply to inquiries by letter, but telegrams with replies prepaid will be answered. Correspondents are requested to write their names and pseudonyms distinctly.*

"Shareholder" (Capetown).—As announced in our last issue, boring is to start at once.

"Hard-up" (Langlaagte).—Highly speculative.

"R.B."—Thanks.

"Apex" (Bellville).—The prospectus is dealt with in this issue.

"Janky Das."—You will receive one new share for every three Cloverfields, and three new shares for every eight Rand Klips. In addition, you will receive an option on one new share for three years at 21s. 3d. for every two new shares held and a further option on one new share at 22s. 6d. for four years for every two new shares.

"W.W." (Geldenhuis).—We know of nobody likely to undertake the work.

"A.H.B." (Capetown).—(1) The figures duly appeared. (2) The company has liability to-day of about £300,000 for advances made to it, and has no cash in hand, as naturally any excess of profit over capital expenditure, interest, etc., is applied in redemption of the debt.

"Interested" (Knights).—(1) Doing rather better, but very speculative. (2) Cannot advise regarding the other speculations.

"J.A.N." (Ladybrand).—(1) "Economic Geology" is published semi-quarterly at 41 North Queen Street, Lancaster, Pa. (2) We do not issue such a list. (3) Better write to the Technical Bookshop, Salisbury House, London Wall, for the books you require.

## S.A. Mining Year Book.

Commenting on the last issue of the "S.A. Mining Year Book," the *B.S.A. Export Gazette* writes:—"The second annual issue of the most exhaustive work published on South African mining is a great improvement on its predecessor, though the first issue was a sufficiently remarkable production. New features have been introduced and old ones expanded, while fuller classification has been provided. In addition to the annual statements of the various mining groups, the work contains informative and interestingly written articles on various phases of mining in the Union and Rhodesia, notably on that absorbing topic of the future of the Far East Rand. The work is illustrated by portrait and view, map and plan, and is a very creditable specimen of the printers' art—an ornament, therefore, as well as a useful adjunct to any office."

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## TRANSVAAL GOLD OUTPUT NEARLY FORTY MILLIONS.

### All Records Beaten—December Production Shows Decrease—Detailed Annual and Monthly Returns.

THE gold output of the Transvaal for the past year was 9,295,538 ozs., value £39,484,934. It exceeds the previous highest total—for the year 1912—by 171,239 ozs., value £727,374, and it is 201,867 ozs., value £857,473, better than the output for 1915, thus constituting a record. The monthly outputs for the past year are as follows:—

	Ozs.	Value.
January ... ..	787,467	£3,344,918
February ... ..	753,594	3,201,063
March ... ..	796,689	3,384,121
April ... ..	754,672	3,205,643
May ... ..	777,681	3,303,377
June ... ..	761,764	3,235,767
July ... ..	761,087	3,232,891
August ... ..	781,150	3,318,116
September ... ..	771,567	3,277,498
October ... ..	792,339	3,365,642
November ... ..	783,066	3,326,253
December ... ..	774,462	3,289,705

The totals for the past fifteen years are as follows:—

1902 ... ..	1,767,661	£7,253,665
1903 ... ..	2,955,749	12,589,248
1904 ... ..	3,779,621	16,054,809
1905 ... ..	4,897,221	20,802,074
1906 ... ..	5,786,617	24,579,987
1907 ... ..	6,451,384	27,403,738
1908 ... ..	7,052,617	29,957,610
1909 ... ..	7,280,545	30,925,788
1910 ... ..	7,533,813	32,001,735
1911 ... ..	8,237,723	34,991,620
1912 ... ..	9,124,299	38,757,560
1913 ... ..	8,794,824	37,358,010
1914 ... ..	8,378,139	35,588,075
1915 ... ..	9,093,671	38,627,461
1916 ... ..	9,295,538	39,484,934

The figures for November and December, 1916, are as follows:—

WITWATERSRAND.		
	Ozs.	£
November ... ..	756,370	3,212,854
December ... ..	748,491	3,179,386
Decrease ... ..	7,879	33,468
OUTSIDE.		
November ... ..	26,696	113,399
December ... ..	25,771	110,319
Decrease ... ..	725	3,080
GRAND TOTAL.		
November ... ..	783,066	3,326,253
December ... ..	774,462	3,289,705
Decrease ... ..	8,604	36,548

In December the Transvaal mines produced 774,462 ozs. of gold, valued at £3,289,705, which is 8,604 ozs., value £36,548, less than the total for November. The falling off is due to the fact that the number of stamps at work in December was 80 less than in November, while in addition there was no milling on Christmas Day.

#### STAMP POSITION.

The official statement showing the stamp position is as follows:—

	Rand.	Outside.	Total.
November ... ..	9,230	162	9,692
December ... ..	9,185	427	9,612
Decrease ... ..	45	35	80

#### NATIVE LABOUR.

At the last day of the month the number of natives employed by the W.N.L.A. and contractors was as follows:

Gold mines ... ..	191,547
Coal mines ... ..	11,487
Diamond mines ... ..	5,194
Total ... ..	208,228

#### INCREASES AND DECREASES.

	Value.	Increase.	Decrease.
Aurora West ... ..	£18,163	—	£111
Bantjes ... ..	22,368	—	3,785
Brakpan Mines ... ..	88,756	—	3,997
City Deep ... ..	126,676	£5,633	—
City and Suburban ... ..	50,225	—	174
Cons. Langlaagte ... ..	64,617	960	—
Cons. Main Reef ... ..	42,898	1,478	—
Crown Mines ... ..	239,555	—	18,529
Durban Roodepoort ... ..	14,124	—	63
Durban Deep ... ..	34,793	—	26
East Rand Proprietary ... ..	186,136	—	161
Ferreira Deep ... ..	91,178	—	6,715
Geduld ... ..	42,796	595	—
Geldenhuis Deep ... ..	71,646	—	2,931
Ginsberg ... ..	14,531	—	226
Glencairn ... ..	13,270	—	89
Government Areas ... ..	119,119	2,434	—
Jupiter ... ..	25,206	1,168	—
Knight Central ... ..	26,799	55	—
Knights Deep ... ..	79,382	—	5,487
Langlaagte Estate ... ..	60,602	200	—
Luipaardsvlei ... ..	22,118	—	1,852
Main Reef West ... ..	29,288	1,232	—
May Consolidated ... ..	8,279	—	1,915
Meyer and Charlton ... ..	41,088	—	1,224
Modder B. ... ..	101,725	—	2,748
Modder Deep ... ..	76,387	—	1,418
New Goch ... ..	28,043	569	—
New Heriot ... ..	23,180	—	327
New Kleinfontein ... ..	87,975	—	1,299
New Modder ... ..	120,665	1,924	—
New Primrose ... ..	16,485	—	34
New Unified ... ..	13,801	98	—
Nourse Mines ... ..	61,456	1,729	—
Princess ... ..	28,685	990	—
Randfontein Central ... ..	243,064	790	—
Robinson ... ..	70,627	1,164	—
Robinson Deep ... ..	76,846	314	—
Roodepoort United ... ..	34,258	—	1,143
Rose Deep ... ..	69,811	994	—
Simmer and Jack ... ..	70,886	3,963	—
Simmer Deep ... ..	56,431	—	1,873
Van Ryn ... ..	47,094	—	833
Van Ryn Deep ... ..	92,384	382	—
Village Deep ... ..	79,072	3,203	—
Village Main ... ..	42,065	—	909
Vogel Estates ... ..	13,465	573	—
West Rand Consolidated ... ..	42,936	1,087	—
Witwatersrand ... ..	51,232	—	2,341
Wit. Deep ... ..	45,740	—	1,155
Wolhuter ... ..	41,946	—	2,260
Miscellaneous ... ..	9,514	—	1,408

#### OUTSIDE DISTRICTS.

Nigel ... ..	14,221	—	1,181
Sub Nigel ... ..	20,754	—	535
Barrett ... ..	1,121	—	570
Sheba ... ..	8,228	—	136
Fairview ... ..	2,239	—	51
T.G.M.E. ... ..	34,746	—	153
Glynn's ... ..	10,224	1,729	—
Miscellaneous ... ..	18,786	—	2,183

## DECEMBER GOLD OUTPUT: GROUP RETURNS.

### Rand Mines Group.

The following are the results of crushing operations of Central Mining companies for the month of December:—

Company	No. of Stamps Running.	Tube Mills.	Tons crushed.	Estimated Working Costs per Ton.	Total Fine Ozs.	Total Estimated Profit.
Modder B. ...	196	6	45,000	19/ 1.3	23,948	£56,589
New Modder ...	180	7	55,000	18/ 11.0	28,407	66,111
City Deep ...	154	9	62,500	21/ 5.1	29,823	57,357
Village Deep ...	180	7	51,300	21/ 3.4	18,615	22,640
Village Main R. ...	160	4	30,000	18/ 0.2	9,903	14,238
Robinson ...	245	6	57,300	13/ 5.9	16,627	30,791
Bantjes ...	90	3	22,980	20/ 11.1	5,266	*2,157

Tls. & averages 1105 42 324,080 18/10.8 132,589 £245,569

aIncludes 16 Nissen stamps. bIncludes 4 Nissen stamps.

\* Loss.

The following are the results of crushing operations of subsidiary companies for the month of December:—

Company.	No. of Stamps Running.	Tube Mills.	Tons crushed.	Estimated Working Costs per Ton.	Total Fine Ozs.	Total Estimated Profit.
Rose Deep ...	300	7	62,200	16/ 6.7	16,434	£16,566
Geldenhuis Dp. ...	300	7	59,700	19/ 2.0	16,867	12,913
Nourse Mines ...	180	5	40,000	23/ 7.2	11,391	12,854
Ferreira Deep ...	280	7	52,540	20/ 6.1	21,465	35,364
Crown Mines ...	660	26	187,000	17/ 9.3	56,396	68,386
Durban Rd. Dp. ...	100	3	24,100	25/ 1.0	8,191	3,884

Tls. & averages 1820 55 425,510 19/ 1.1 133,747 £149,967

*Crown Mines.*—The quantity of rock broken was equal to the average of previous months. There is an accumulation of rock in the stopes and much larger tonnage could have been milled had it not been for the severe shortage of tranning and shovelling boys.

### Albu Group.

The following information is officially supplied regarding the December operations of the producing companies of the Albu group:—

Company.	Stamps.	Tons Crushed.	Total Cost.
Aurora West ...	80	15,000	£13,498
Meyer and Charlton ...	75	14,760	13,782
New Goch ...	120	30,110	18,699
Rodepoort United ...	80	35,843	31,366
Van Ryn Estate ...	140	39,200	28,273
West Rand Consolidated...	100	34,000	33,948

595 168,913 £139,566

Company.	Cost per Ton.	Total Revenue.	Profit.
Aurora West ...	18/ 0.0	£18,036	£4,538
Meyer and Charlton...	18/ 8.1	40,500	26,718
New Goch ...	12/ 5.0	27,810	9,111
Rodepoort United ...	17/ 6.0	34,160	2,794
Van Ryn Estate ...	14/ 5.1	46,485	18,212
West Rand Consolidated..	19/ 11.6	42,514	8,566

£209,505 £69,939

### Goerz Group.

Results of operations on the producing mines of this group for the month of December:—

Company	Stamps.	Tons Crushed.	Total Revenue.	Revenue per ton.
Geduld Proprietary ...	60	28,500	£43,218	30/ 4
May Consolidated ...	100	9,430	8,413	17/ 10
Modder Deep Levels...	70	39,000	76,024	39/ 0
Princess Estate ...	60	22,800	28,966	25/ 5

Totals ... 290 99,730 £156,621 —

Company.	Costs.		Profit.	
	Total.	Per Ton.	Total.	Per Ton
Geduld Proprietary ...	£29,768	20/ 11	£13,450	9/ 5
May Consolidated ...	8,658	18/ 4	245*	—
Modder Deep Levels ...	31,111	16/ 0	44,913	23/ 0
Princess Estate ...	27,670	24/ 3	1,296	1/ 2

Totals ... £97,207 — £59,414 —

\* Loss.

*Geduld Proprietary Mines, Ltd.*—Owing to unavoidable delay in the erection of the new plant, it will not be ready to start work until next March.

*May Consolidated G.M. Co., Ltd.*—The yield is unduly high owing to some of the launders having been cleaned during the stoppage of the plant.

### Consolidated Gold Fields Group.

The following are particulars in regard to the outputs and profits for the month of December of the undermentioned companies of the Consolidated Gold Fields group:—

Company.	No. of Stamps.	Tube Mills.	Tons Crushed.	Gold declared. Fine Ozs.	Total Profit.
Simmer and Jack ...	320	7	64,900	16,338	£20,642
Robinson Deep ...	115	8	43,500	17,519	25,503
Knights Deep ...	100	11	103,600	18,988	13,865
Simmer Deep ...	220	10	62,300	13,285	5,404
Jupiter ...	80	5	23,400	5,934	2,703
Sub Nigel ...	30	2	9,120	4,886	6,086

Totals ... 1165 43 306,820 76,950 £74,203

*Reserve Gold.*—Simmer and Jack, 800 ozs.; Robinson Deep, 1,572 ozs.; Simmer Deep, 1,085 ozs.; Jupiter, 715 ozs.; Sub Nigel, 2,213 ozs.; total, 6,385 ozs.

The sundry revenue included in the above total declared profit is as under: Simmer and Jack, £1,500; Robinson Deep, £378; Knights Deep, £120; Simmer Deep, £704; Jupiter, £752; Sub Nigel, £159; total, £3,613.

### Neumann Group.

The following are particulars of the results achieved by the crushing companies of this group during last month:—

	TONS.	YIELD.	PROFIT.
Witwatersrand Deep ...	40,100	£44,826	£8,607
Wolhuter ...	34,000	41,072	11,329
Consolidated Main Reef ...	29,040	42,039	14,347
Main Reef West ...	25,960	28,700	2,238
Knight Central ...	24,000	26,229	107

Total for group ... £182,866 £36,673



**Robinson Group.**

The following are the results for December of the Robinson group of companies:—

	Tons milled.	Revenue per ton.	Profit.
Langlaagte Estate ...	51,906	23 0·82	£13,026
Randfontein Central ...	181,547	26 2·77	76,002

**Nigel G.M. Co.**

The returns from this company's mine for the month of December are as follows:—Tons milled, 10,700; gold, 3,430 fine ozs.; profit, £1,466.

**Brakpan Mines.**

Stamps working, 40; running time, 21 days; ore crushed, 50,600 tons; tube mills working, 10; ore hoisted, 57,951 tons; ore from dump, nil; waste sorted, 14·32 per cent.; fine gold declared, 20,895·70 ozs.; value declared, £87,965, equal to 34s. 9·22d. per ton milled; working costs, £54,034, equal to 21s. 4·29d. per ton milled; working profit, £33,931, equal to 13s. 4·93d. per ton milled. The decrease in the tonnage milled is due to the overwinding accident which occurred at the north shaft on the 8th of December. The repairs to the headgear were completed on the 27th of December and normal conditions now prevail.

**Transvaal G.M. Estates.**

The following are the particulars of the Transvaal Gold Mining Estates output for the month of December:—Central Mines: Tons crushed, 13,100, yielding 6,199·7 fine ozs. Elandsdrift Mine: Tons crushed, 1,500, yielding 988·5 fine ozs. Vaalhoek Mine: Tons crushed, 2,000, yielding 680·3 fine ozs. Estimated value of month's output, £33,846; estimated profit for the month, £13,222.

**Glynn's Lydenburg.**

The following are the particulars of the output of Glynn's Lydenburg for the month of December:—Tons crushed, 4,155, yielding 2,406·8 fine ozs.; estimated value of month's output, £9,208; estimated profit for the month, £4,489.

**New Heriot.**

The result of the New Heriot's operations for the month of December is as follows:—Ore milled, 13,000 tons; gold recovered, 5,457 ozs.; profit, £7,607.

**East Rand Proprietary Mines.**

The E.R.P.M. returns for the month of December are as follows:—820 stamps milled 153,000 tons; 43,820 ozs. fine gold recovered, valued at £182,116; profit for the month, £38,240.

**New Kleinfonteins.**

Stamps, 250; days, 28·509; tube mills, 7; tons milled, 73,240; gold recovered, 20,710·776 fine ozs.; net value, £85,738 9s.; profit, £20,334 8s. 2d.; working costs (excluding development), 16s. 1·321d.; development to working costs, 1s. 9d.; total working costs, 17s. 10·321d.; capital expenditure, £2,673 2s. 6d.

**Springs Mines.**

The following cable has been despatched to the London office of the Springs Mines for publication: "Trial crushing commenced on the 8th January, 1917."

**Luipaardsvlei Estate.**

During the month of December, 1916, this company crushed 20,670 tons, the total profit won being £2,286 10s.



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## THE WEEK IN THE SHAREMARKET.

### Business Dull and Weak—Far East Stocks Fluctuate.

BUSINESS on Friday afternoon and Saturday showed no material change in prices and was somewhat restricted. On Monday morning the tendency was one of dullness, with weakness in the Modder group and Springs, otherwise nothing of note. For the time being speculation in fancy goods and possibilities is at a standstill. Expectations of the great things that were to happen if certain transactions came off have been so disappointing to backers that they now seem inclined to wait until things have really happened. The market weakened during the afternoon. Tuesday morning provided one of those unaccountable incidents which occur from time to time on the share market. Springs Mines, whose crushing has been eagerly looked for, having now made a start, the outcome of which cannot possibly be foretold as yet, were the object of a howling match of considerable volume. The net result was a fall of 2s. on the previous day's quotation. Modder Bs. were also unexpectedly weak, while Modder Deeps obtained no quotation either way. In the remainder, there was little or no change, business being generally limited in volume. During the afternoon Springs continued to be the chief attraction, though with very little fluctuation in prices. On Wednesday morning the whole tendency was lower, and in many cases the first reasonable offer was accepted. There was not much liquidation, but very little inclination to buy. Randfonteins were, however, firm, though there must be some doubt in certain quarters of their so continuing, seeing that a parcel was offered at 17s. 3d. sixty days' buyer's option against a cash buying offer of 17s. Government Areas were wanted on time, but not obtainable. On Thursday morning Randfonteins were offered again at sixty days' buyer's option, but this time at 17s. The main feature was the weakness in Bantjes, which began to show itself on Wednesday afternoon. At one time it looked as if the rot was going to be stayed at 10s., but the stock is evidently out of favour, and one sale after another took place on high change, each time lower than the previous one. In outside stocks little has been doing, the last prices being Henderson's Options, sellers at 1s.; New Farms, buyers 1s. 6d.; Randfontein Explorations, buyers 2s.; South Van Ryns, 7s. 3d. to 7s. 9d.; Daggafontein Options, 8s. buyers; and New Areachaps, 8s. 6d. buyers.

On Friday morning the market weakened still further and business was limited. The only stock showing any signs of strength being Wollbuters, for which there was a buyer at 10s. Bantjes commenced with sales at 8s. 8d., finishing at 8s. 6d. sellers. Kleinfonteins got another shake out and were sold at 20s. Sub Nigels made 22s. 3d. and Springs 58s.; Modder Bs. eased off to £7 6s. 6d. sellers.

	Fri. 5th.	Sat. 6th.	Mon. 8th.	Tues. 9th.	Wed. 10th.	Thurs. 11th.
African Farms	8 3	8 3	8 0*	8 6+	—	8 3+
Apex Mines	6 3+	6 3+	6 3+	6 3+	—	—
Aurora Wests	—	—	—	13 0*	13 0*	13 0*
Bantjes Cons.	—	10 11	10 10*	10 8	10 9*	9 8
Blauwboosch Diamonds	77 6*	—	—	—	—	—
Brakpan Mines	94 6	94 0*	94 0*	93 0*	93 0	91 6
Breyten Collieries	16 3*	16 6	16 3*	16 3*	—	—
Brick and Potteries	—	—	—	5 0*	—	—
British South Africa	—	—	—	—	13 6+	13 0+
Bushveld Tins	0 4*	—	0 4*	—	—	—
Cinderella Cons.	—	5 6+	5 9+	5 9+	5 9+	5 0+
City and Suburbans	34 6	34 6	34 9	34 6*	34 6	34 6
City Deeps	79 0	80 0	79 0*	78 6*	78 0	78 3
Cloverfield Mines	8 4*	8 3*	8 7*	8 6*	8 6	8 6
Clydesdale Collieries	—	12 9*	13 0*	13 0*	13 0*	13 0*
Concrete Construction	—	2 0*	2 0*	2 0*	2 0*	2 0*
Cons. Investment	18 9*	18 6*	18 6*	18 3*	—	—
Cons. Langlaagtes	26 6+	26 0+	26 0+	26 0+	—	—
Cons. Main Reefs	17 0*	16 9*	17 0*	17 6+	17 3+	16 9*
Cons. Mines Selection	21 9*	21 6*	21 6	21 3*	21 3	20 9*
Coronation Freeholds	0 5+	—	—	—	—	—
Coronation Syndicates	3 0+	—	—	—	—	—
Crown Diamonds	—	2 3*	2 3*	2 6*	2 0*	2 3*

\*Buyers. †Sellers. √Odd lots. BEx London.

	Fri. 5th.	Sat. 6th.	Mon. 8th.	Tues. 9th.	Wed. 10th.	Thurs. 11th.
East Rand Coals	2 4	2 3	2 4	2 4*	2 3*	2 3*
East Rand Deeps	1 2*	1 2*	1 2*	1 2*	1 2*	1 2*
East Rand Mining Estates	15 0+	14 9+	12 0*	14 0	14 6+	—
East Rand Props.	12 0*	12 6*	12 9	12 3*	12 6	12 5*
East Rand Debentures	—	£67½*	£67½*	£70+	—	—
Eastern Gold Mines	—	—	—	1 2*	1 3*	1 3
Frank Smith Diamonds	4 4*	4 7	4 10	4 7	4 8	4 7*
Geduld Props.	41 6	41 6*	41 6	—	41 0	41 3+
Glencairns	—	—	1 0*	1 0*	1 0*	1 0*
Glencoe Collieries	9 6	9 0*	9 0*	9 0*	9 0*	—
Glyn's Lydenburgs	15 0+	15 0+	15 0+	—	15 7+	15 0+
Government Areas	53 6	53 9*	54 0	53 6	53 1½	53 3
Jupiters	7 0*	—	—	—	—	—
Knight Centrals	9 1*	9 2*	9 2*	9 1	9 0	9 0
Knights Deeps	—	25 0+	21 0*	25 0+	25 0+	—
Lace Props.	5 9*	5 9*	5 9*	5 9*	5 9	5 6*
Luipaardsvlei Estates	—	—	8 0+	—	—	—
Lydenburg Farms	6 3	6 3*	6 3*	6 6*	6 4*	6 5*
Main Reef Wests	4 6*	4 4*	4 5*	4 9	4 4	4 5*
Middelvlei Estates	1 8	1 6*	—	1 6*	1 6*	1 6*
Modderfontein B.	147 0*	149 6	148 0	148 0+	144 6*	147 0
Modder Deep Levels	137 6	137 0	—	—	133 0*	133 6*
Leeuwpoot Tins	13 0+	12 0*	12 6+	—	—	—
Natal Navigation Colls.	19 0*	19 0*	19 0*	—	19 0*	—
New Boksburgs	1 8	1 8*	1 6*	1 6*	—	1 8+
New Eland Diamonds	16 0*	16 0*	—	—	17 6*	17 6*
New Era Cons.	9 0	8 6*	9 0*	8 6*	8 6*	—
New Geduld Deeps	6 0	6 0*	6 0	6 2	6 1*	6 2*
New Gochs	—	—	—	10 0+	—	—
New Heriots	—	—	—	—	—	42 6
New Kleinfonteins	22 0*	22 0	22 0	22 0	21 6	21 3
New Modderfonteins	362 6*	362 6*	360 0*	357 6*	362 6*	363 9*
New Rietfonteins	0 10*	0 10*	—	0 10*	—	—
Nourse Mines	23 6	23 0+	22 6	21 9*	21 3*	21 6*
Premier Preferreds	—	—	—	135 0*	—	135 0*
Pretoria Cements	70 0*	70 0*	77 0+	77 0+	75 0*	—
Rand Collieries	—	—	2 6*	2 6*	2 9*	2 6*
Rand Klips	8 10*	9 6*	9 6	9 4*	9 5	9 3*
Rand Mines	70 0+	—	—	—	—	—
Rand Nucleus	1 5*	1 5*	1 5	1 5*	1 5	1 5*
Randfontein Deeps	7 0	6 10*	6 9*	6 9*	6 6*	7 0+
Randfontein Estates	16 6	16 6*	17 0	17 0	17 0	16 6
Rietkuils	—	—	—	—	—	7 0*
Roberts Victors	—	—	—	—	—	9 3*
Rooiberg Minerals	6 9*	7 0*	7 0*	7 0*	7 0*	—
Roodepoort Uniteds	9 6*	10 0+	10 0+	10 0+	9 6+	8 0*
Ryan Nigels	—	—	—	2 6*	2 8*	2 6*
Shabas	1 0*	—	1 3*	1 3*	1 3*	1 3*
Simmer Deeps	—	3 10+	3 3*	3 9+	3 0*	3 6*
S.A. Breweries	28 0*	—	—	28 0*	—	28 0*
S.A. Lands	4 7	4 7*	4 7*	4 7*	4 7*	4 6*
Springs Mines	61 0	60 9	59 9	58 0	57 9	58 3
Sub Nigels	23 3*	23 0*	22 9*	22 9	22 6*	22 6
Swaziland Tins	—	—	30 0+	—	—	—
Rand Selections	70 6	71 0+	70 0+	69 0+	68 0	68 0
Transvaal G.M. Estates	17 0*	17 0*	17 0*	16 0*	17 0*	17 0*
Van Ryn Deeps	63 9	64 3	64 6*	64 6	64 0	64 0
Village Deeps	—	27 6+	27 6+	27 6+	27 6+	27 6+
Vogel Cons. Deeps	1 7	1 9	—	1 6*	1 6*	—
Welgedachts	21 0*	22 0*	20 0*	22 0*	22 0*	22 0*
Western Rand Estates	2 0*	2 0	2 0	2 0*	2 3	2 3*
Witwatersands	50 0+	50 0+	48 0+	—	47 0+	47 0+
Witwatersrand Deeps	19 0+	19 0+	18 6+	16 6*	18 6+	—
Wollbuters	9 7*	9 7*	9 9	9 9	9 9*	9 10*
Zaaiplaats Tins	7 6*	7 6*	7 6*	7 6*	7 6*	7 6

There were buyers during the week of Union 5 per cent. Loan at prices ranging from £100 to £100 10s., while a sale was put through at £100 11s. 3d.

\*Buyers. †Sellers. √Odd lots. BEx London.

### Village Main Reef.

The directors of the Village Main Reef G.M. Co. report: "Underground operations have proceeded without serious stoppages throughout the quarter, the tonnage milled showing an increase of 3,515 tons. Working costs have averaged just over 18s. per ton, indicating a return to more normal conditions. Owing to a lower yield, the profit for the quarter was slightly less than for the previous period. Control of the yield is, under present mining conditions, somewhat difficult."

## RAILWAY AND HARBOUR FINANCES.

### Items from Auditor-General's Report.

THE Controller and Auditor-General (Mr. W. E. Gurney) in the course of his report on the accounts of the S.A. Railways and Harbours for the financial year ended March 31 last, points out that although there was an excess of expenditure over receipts in 1914-15 of £543,796 4s. 6d., a sum of £1,749,244 13s. 11d. was in that year included in expenditure and transferred to Renewals Fund, and at the same time £50,000 was paid towards the deficiency in the Pension Fund. In 1915-16 only £133,197 13s. 6d. was paid to the Renewals Fund, and nothing to the deficiency in the Pension Fund. The surplus in 1915-16 may, therefore, be chiefly attributed to the absence of such contributions to the Renewals and Pension Funds, and had they been continued on the same basis, there would have been a deficit of £308,689 15s. 1d. The working capital appropriated at March 31, 1915, was £1,374,368 13s. 9d., which was increased during the year 1915-16 by £45,543 4s. 2d., making a total at March 31, 1916, of £1,419,911 17s. 11d. The additional amount was made up of the expenditure during the year, as shown in statement No. 79 on page 102, £45,432 10s. 3d., with the addition of £110 13s. 11d. for certain assets in connection with Table Bay Harbour transferred to subsidiary services.

#### ROAD MOTOR SERVICES.

The earnings and expenditure of the road motor services are as follows:—Hermanus-Bot River: Earnings, £3,015; expenditure, £3,862; Brandfort-Haagenstad: Earnings, £37; expenditure, £937; total earnings, £3,052; total expenditure, £4,800. The heavier loss on Hermanus-Bot River service, as compared with the previous year, appears to be due to heavy charges for repairs to cars brought up in November, 1915.

#### WORKING OF NEW RAILWAYS TO PROTECTORATE.

In terms of Section 1 of the Public Railways (Working and Closing) Act, No. 41 of 1916, the Administration took over and worked the new lines constructed for the conduct of military operations from Upington South to border of the Protectorate, and Walvis Bay Settlement to the border of the Protectorate, as from the 1st August, 1915.

#### SCRAP-IRON CONTRACT.

A great deal has been written in previous reports in regard to the scrap-iron contract with the Union Steel Corporation, Ltd., and several points were at issue. The first of these was the non-settlement of amounts due by the Corporation. A complete settlement was, however, reached in January, 1916. The charges against the Corporation to that date amounted, with interest, to £18,275 17s. 4d. Payments in cash had been received from the Corporation

amounting to £6,800, and the steel purchased by the Administration to December 31, 1915, at the contract rate, amounted to £11,805 12s. 9d.; there was thus a balance of £329 15s. 5d. due to the Corporation, which was paid over on January 17, 1916. All sales since are made on a cash basis. The question of what further scrap-iron the Corporation is entitled to receive under the terms of Clause 4 (a) of the agreement is still under investigation, and the disposal of the stock at the various depots is receiving attention.

#### RAILWAY SLEEPER PLANTATIONS.

The gross expenditure brought up during the year under review is £14,672 11s. 4d. The revenue credited to the account amounted to £4,877 12s. 2d., leaving a net expenditure of £9,794 19s. 2d.

#### Wolhuter.

The reduced tonnage and profit for December are due to minor pumping difficulties and slight eaving of upper workings, which interrupted hauling at Mynpacht Shaft. Regular operations were resumed on the 3rd January, 1917.

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## TIME AND LABOUR SAVING ON THE RAND.

THE broad principles which govern the question of sorting or discarding waste rock from the ore mined are as follows:—(1) Sorting is impossible, firstly, where an appreciable proportion of the country rock carries payable values and cannot readily be distinguished from that which is barren, and, secondly, where the waste mined in the stopes exists in narrow bands. (2) Sorting is imperative where the proportion of waste rock broken in the stopes is large, and where such waste rock exists in relatively wide bands and is practically valueless. The majority of cases, however, fall between these two extremes, and many other factors have to be taken into consideration before it is possible to decide for or against sorting in any particular mine. The distribution of the gold within the payable area is a factor of great importance. In most mines the gold is confined to the bands of conglomerate, and the quartzite is more or less barren, but, in others, gold exists in the quartzite some little distance away from the reef in a narrow streak carrying carbon and in bands of pyrites running through the quartzite. In these latter cases the manager must decide for himself whether the average native or other labourer can be sufficiently trained to distinguish the barren from the gold-bearing rock, and, if such decision is adverse, sorting becomes impossible. Dealing now with the more usual occurrence when only the bands of conglomerate are payable, and when these are mined with a varying proportion of quartzite carrying little or no gold, the question of sorting, naturally, is influenced by the value of this quartzite and the recovery which can be obtained from it. Probably the most complete data available on this subject is that obtained by the Mines Trial Committee from the experiments carried out on their behalf during 1913 by Mr. Andrew Crosse. For these experiments samples of waste rock were collected by the committee from 22 different mines. These samples were assayed and showed values ranging from 0.2 dwt. to 0.35 dwt., and an average value of 0.29 dwt. per ton. As regards the extraction to be expected from this waste, here, again, valuable information is obtained from the same experiments, concerning which Messrs. Caldecott and White, the members of the Executive Sub-Committee, write as follows: "The conclusion to be deduced from an examination of all the figures given is that the extraction to be expected from waste rock, such as is usually being sorted out at present, would not be much lower than that obtained from the ore on any mine, and that an allowance of 5% would in most cases amply cover the deficiency." On a mine equipped on modern lines, the average extraction which might be expected from reef would be about 96%, so that, if we accept the above statement, the extraction to be expected from waste rock on such a mine would be about 91%.

The next question which arises is the percentage of the barren quartzite which it is possible to sort without undue risk of rejecting valuable gold-bearing rock. This, of course, will vary considerably, according to local conditions. A good rule for arriving at such a figure is to take from the sampling records a large number of complete sections of the reef series (choosing only sections where the reef is fully exposed) and to calculate the probable stoping width therefrom. This can be done, in cases where the reef width plus width of included waste is too narrow for stoping, by adding on a sufficient width of quartzite, and, in the case of wide reefs, by assuming that 15 inches of waste rock over and above the width of the reef series still to be stoped. From these theoretical stope sections the percentage of sorting may be calculated on the assumption that from bands of waste under 4 inches in width nothing will be sorted, and that from other bands of width of 4 inches and over, 50 per cent. can be sorted. Of course, this rule will not be quite accurate for every section, but it is probable that in most cases it will give a figure closely approximating to the percentage of sorting which can be attained. Having dealt with the possibility of sorting, we now have to consider the circumstances under which it is advisable. The main points to be taken into account under this head are, the recovery which would be yielded by sortable waste if it were to be treated, and the cost of such treatment. As regards the recovery to be expected, we have already mentioned that, from the Mines Trials Committee's experiments, the average value of waste rock on these fields is about 0.29 dwt. per ton. This, however, is a figure which cannot be applied indiscriminately, and in order correctly to determine the value of waste rock at any particular mine it would be necessary either to make trial crushings and sample the pulp, or to carry out careful and systematic sampling underground. Should the latter method be employed, a further allowance must be made for the small quantity of reef which almost invariably is included in the waste sorted, particularly on mines where single stage sorting is in operation. The cost of treatment, necessarily, is a figure which varies within very wide limits on different mines, according to the class of plant and size of units. As regards the cost of sorting, a native, working efficiently, should be able to sort out 10 tons per diem, which, taking the cost of the native, including compound charges, at 2s. 6d., would be equal to 3d. per ton. The disposal of the sorted waste could be effected for another 1½d., to which might be added a further ½d. per ton for general charges, bringing the total cost of sorting to 5d. per ton. From figures obtained from two modern and newly-equipped mines, it is found that the average cost of crushing, transport to mill, milling, tube milling and cyaniding works out at 2s. 7½d. in the one, and 2s. 10½d. in the other case—an average of 2s. 9d. Suppose now that, at a mine where the above conditions of costs prevailed, the value of the sorted waste was 0.4 dwt. per ton. At a 91 per cent. extraction this would yield 0.36 dwt. or 1s. 6d. If everything were milled, 2s. 9d. would be spent on the waste rock and 1s. 6d. would be recovered from it—a net loss of 1s. 3d. On the other hand, if it were sorted out, 5d. would be spent without any return. This case, therefore, shows an advantage of 10d. per ton in favour of sorting. In the above calculations it has been assumed that the waste rock would have a value of 0.4 dwt. Suppose for a moment that this value was 0.65 dwt.—a by no means uncommon figure. From the latter an extraction of 0.59 dwt.

or 2s. 6d. per ton would be expected. In this case, by milling the waste rock, only 3d. per ton would be lost, whereas, if sorted out, it would cost 5d. per ton. Sorting, therefore, shows a net loss of 2d. per ton, and the obvious course here is to put the waste rock through the mill and sort nothing at all. In considering these figures, the case against sorting becomes stronger where a mine is already equipped with a large reduction plant, which is not running at its full capacity. In such a case it would often pay to mill the waste rock even if the recovery value were substantially less than the average cost of treatment. Suppose, for the sake of example, that, with a mill of 200 stamps, sorting is being carried out, and that, owing to shortage of rock, only 180 stamps are at work. It is extremely likely that the other 20 stamps could be run without extra labour, and with only a small increase in the power cost, particularly in the case of a mill driven by a steam engine. The only other increase in cost, therefore, would be a proportionate charge for stores, such as mercury, cyanide, zinc, oil, grease, etc., dump expenses and the maintenance cost. It is obvious, therefore, that, in such a case, it would pay to stop sorting and run the full mill, since, not only should we obtain extra revenue at a very slightly increased expenditure, but, in addition, the cost of sorting would be saved and the natives employed would be released for work elsewhere. Conversely, where, owing to antiquated and ill-designed plant, small units, or for other reasons, the extraction is low and reduction costs are high, the question of sorting becomes one of primary importance, and it is imperative to sort up to the economic limit. In many old plants the extraction from reef may be as low as 93 per cent., and the cost of crushing, transport to mill, tube milling and cyaniding may be as high as 4s. or even more. In such cases, providing that the mill can be fully supplied with ore, it would pay to sort out waste rock of a value of nearly 1 dwt., calculating on the same basis as before, viz., that the extraction from waste will be 5 per cent. less than the extraction from reef, and that sorting will cost 5d. per ton sorted. In the case of a new mine which has not been equipped with a reduction plant, exactly the same arguments as those already mentioned will apply, with the further consideration that the relative costs of the plants must be taken into account. This case, however, is not one of vital importance, and scarcely comes within the scope of this sub-committee's terms of reference. If, as the result of the investigations previously described, it should be decided not to do sorting, a certain amount undoubtedly would be saved on trommels, belts and buildings, although the saving would not be so great as might be imagined, since provision in any case would have to be made for picking out the hammer heads, ends of jumpers, pieces of wood, and so on, that are found with the ore, in order to prevent them getting into the crushers. Again, the saving in this direction would be counter-balanced by the cost of the extra crushing plant which would have to be erected to deal with the rock which, had sorting been decided upon, would not have been sent to the reduction works. In the course of writing this report other questions, such as the effect of sorting on the present value of the mine, and the effect of the working capital available upon the policy of working the mine, have suggested themselves, but since they involve financial questions which would be out of place, it has been decided to omit any further reference to them. At the same time, conditions such as these frequently influence the policy of working a mine, and, with it, the question of sorting—particularly in the cases of a new mine which is just starting operations and of a producing mine whose plant is too small and whose financial position does not admit of its being enlarged.—Sub-Committee of Association of Mine Managers of the Transvaal.

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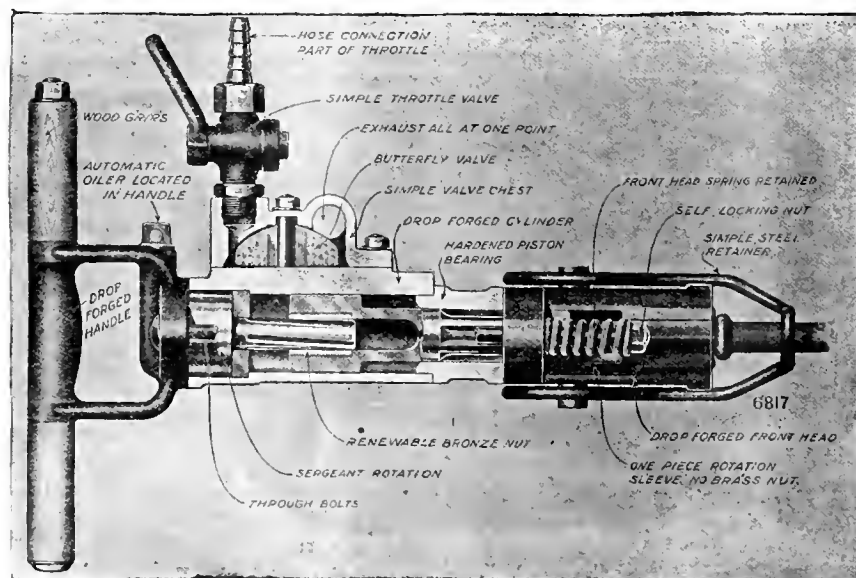
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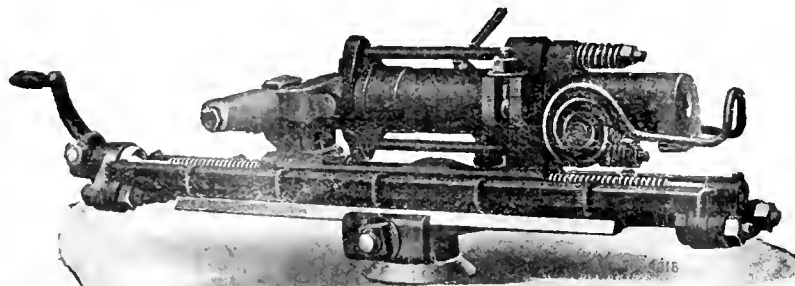
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## THE WEEK IN THE MINING MATERIAL AND ENGINEERING TRADES.

**The Shipping Question—The Buying and the Selling—The Iron and Steel Position—First Instalment of Advances—Electrical Goods Sharply in Demand—Boiler Tubes.**

It is pleasant to record that several returned warriors from German East have looked in at the Commercial Exchange, and each and every one received a hearty welcome. As regards business, the outstanding subject of conversation is that of shipping, hence a visit to the shipping companies. The result was that those immediately concerned seemed less flurried, than in the Exchange and merchants' offices. It was admitted that certain irresponsible rumours had been heard, but not one of them contained the slightest modicum of truth. One can be mentioned, viz., that women and children were not being booked, which is totally untrue. At quite a representative office it was explained that the Imperial Government, through the Union Government, had put new regulations into force, but none of these need cause any disquietude, and any inconvenience must be borne philosophically. A guarded question was put as regards the future and the reply was that no undue alarm was felt, as hitherto the British Navy had grappled with the submarine question fairly well considering the expanse of the oceans, and there was every reason to believe that the Naval authorities were very much alive to cope with the recent drastic threatenings. Subsequent to these interviews several merchants were consulted and it was admitted that people in Johannesburg had not yet seriously realised the shipping position. Even now there was little data to go upon, excepting that it was only commonsense to anticipate trouble, but as to whether it will be greater or less, no one could tell. Hence the immediate conclusion seems to be to proceed very much as usual and obtain goods from all the sources available.

### THE BUYING AND THE SELLING.

The activity noticed at the beginning of this month has slackened off somewhat, but a well founded idea is existent that activity will shortly revive again, as the mines are replenishing stocks, which is their usual practice at this time of the year. It is recognised that during the past six months mining material has been received quite regularly from Britain and America, therefore merchants have been accumulating stocks, and as the mines for several months before the close of last year had been frugal in their purchases, having used from some of the reserves which had been superfluously accumulated beyond the recognised quota. Naturally the London representatives of the various groups put themselves into immediate touch by cable with their Johannesburg houses, hence a quick change in the buying tactics at what was deemed the opportune moment. On the whole the mining supplies position is a very sound one, as the merchants have some twelve months' general stores available and the mine stores have anything up to nine months' stock actually on hand. Of course, there are exceptions, as it has been difficult to collect much surplus in the shape of steel materials as well as copper goods, galvanised iron and many other requisites. However, the best information is that whilst some inconveniences may temporarily exist, yet that will only be a passing phase, as we are sure to obtain a certain amount of supplies in the ordinary way, and the Government will always come to the mines' rescue if any extraordinary combination of adverse circumstances arise.

### IRON AND STEEL.

According to the latest trade advices from the British iron centres, there seems to be no limit to the demand for iron and steel products under present war conditions, and in many directions the rate of production in the British industry, as at other leading world's producing centres, appears to be still inadequate to cope with the enormous requirements. Alongside of the phenomenal pressure experienced in Allied countries in connection with essential needs, the

further remarkable extension of activity which has taken place across the Atlantic in recent weeks has aroused considerable attention, for this tends to complicate matters somewhat with British manufacturers, who have been living in hopes of more substantial relief being experienced from that quarter, especially as regards semi-finished steel. The negotiation of orders for imports of American material is becoming more and more difficult. Not only is the great bulk of the American output needed there but prices have made further upward strides and the movement of supplies is being seriously hindered by the shortage of cars, a rather disquieting feature in view of the existing congestion of business. Under present prosperous conditions of the United States, and in spite of the adverse developments in the grain crops, industrial enterprise in that country is proceeding on an unprecedented scale, and there is not much possibility of any reaction for an indefinite period. The fact that American manufacturers are now encountering some difficulty in securing adequate quantities of raw material also deserves notice. The current output in Britain is being rapidly absorbed, and early delivery is more difficult to obtain than ever. Export sales are restricted, and the calls for deliveries for Continental ports are less urgent, but the terms quoted are nevertheless stiffer, varying from 97s. 6d. to 105s. 1.0.0. according to destination. Hematite seems easier and makers have been induced to accept export orders more freely, especially for Italy. The output of finished iron and steel is practically entirely under Government control. Operations on the part of steel sheet and tinplate manufacturers have been much curtailed, chiefly due to the steel restrictions in force, and foreign consumers must perforce have resort to America to cover some of their urgent requirements. In Johannesburg the following is the first instalment of the advance in hardware goods. Hexagon and cuphead bolts,  $\frac{1}{4}$  in. dia., 1s. 9d. lb.; 5-16 in., 1s. 6d. lb.;  $\frac{3}{8}$  in. dia. up to 3 in. long, 1s. lb.;  $\frac{1}{2}$  in. up to 2 $\frac{1}{2}$  in. long, 62s. 6d. per 100 lbs.; ditto, 2 $\frac{3}{4}$  in. long, 60s.;  $\frac{5}{8}$  in. to 2 $\frac{1}{2}$  in. long, 55s.; ditto, 2 $\frac{3}{4}$  in. long, 52s. 6d.;  $\frac{3}{4}$  in. up to 2 $\frac{1}{2}$  in. long, 52s. 6d.; ditto, 2 $\frac{3}{4}$  in. long, 50s.;  $\frac{7}{8}$  in. and 1 in., same price as  $\frac{3}{4}$  in. diameter.

### ELECTRICAL GOODS.

There has been quite a lot of buying of electrical material, more particularly cables and megohm wires, also small motors, as well as the general run of electrical fittings other than the ordinary lighting lamps, of which there are ample supplies in the town. The British Government has put a bar on the exportation of anything containing copper,

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and as this metal predominates in electrical materials, a sudden hurry occurred to secure stocks. The Public Works Department requisitioned for some miles of cables, also the Premier Diamond Mine came forward with substantial orders for electrical fittings, wiring, etc. The municipalities, mines and Railway Department have been purchasing rather freely, as well as the Messina Copper Mine in the Northern Transvaal. Delagoa Bay and another couple of coast towns came into the market in a lesser degree. The demands created quite a lively diversion in the direction of activity amongst the electrical merchants.

#### PIPING AND BOILER TUBES.

An urgent order was received from the Eastern Province for a parcel of boiler tubes, which was executed by the broker obtaining small lots from different places and filling up with second-hand ones. This is a special feature, but it is an indicator as regards the scarcity of boiler tubes throughout South Africa, as the coast people would not send to Johannesburg if they could get them nearer home. Our mines are well in the market for pipes and pipe fittings in sizes over two inches; some big sizes are absolutely unobtainable. However, in addition to supplies now advised from Britain we can look to America to soon make up any real shortage. In the meantime it is difficult to do business, as most quotations are spot, and no forward ones are made.

#### OILS, COLOURS, WHITE LEAD, ETC.

Business is exceptionally quiet, excepting for wallpapers. The manager of a representative firm has taken the trouble to examine his books for twelve years, and practically the month of January has always been indifferent, and now it is only keeping up its old reputation. Cable advices have been few and far between from London, but the idea is that prices are hardening and apparently the shippers are not pushing business just at the moment.

#### VARIOUS TRADE ITEMS.

Timber quotations remain very firm with an upward tendency, as the position of shipping from the Baltic is very difficult to gauge. There are no 60lb. rails obtainable, but the smaller sizes are available as the Vereeniging works are manufacturing them. Johannesburg engineering shops and foundries are kept in full work and even overtime at some places; however, the labour position is easier, as men are returning from the front, all of whom, so far as can be ascertained, have been placed in their old positions.

#### REVISED PRICE LIST.

Approximate war prices, subject to quick change.—Mining and building hardware: Iron, imported, round up to 1 in., 30s.; 2 in. to 6 in., 25s. per 100 lbs. Ditto, square, up to 1 in., 27s. 6d.; 1½ in. to 2½ in., 23s. 6d.; 2½ in. to 5 in., 25s. Flats, 3-16 in., 37s. 6d.; all from ½ in. up, 30s. Angles, ½ in. to 3-16 in., 40s.; ¼ in., 35s.; 5-16 in. to ¾ in., 30s., excepting 5 x 4 x ¾ in.; mild steel bar, 4½ d. lb.; drill, 7 lb.; steel plates, 10ft. by 4ft. by 1-16th in., 35s.; ½ in., by 3-16 in., 32s. 6d.; ¼ in. to 5-16th in., 31s.; ¾ in., up to 30s.; 10ft. by 5ft. by 1-16 in., 36s. 6d.; ½ in. and 3-16 in., 34s.; ¼ in. to 5-16 in., 32s. 6d.; ¾ in., up to 31s. 6d.; intermediate sizes up to 12ft. by 6ft. by 1-16 in., 37s.; ½ in. and 3-16 in., 34s. 6d.; ¼ in. and 5-16 in., 33s.; ¾ in. and up 32s., all at per 100lb.; hexagon and cuphead bolts, ½ in. dia., 1s. 9d. lb.; 5-16 in. dia., 1s. 6d. lb.; ¾ in. dia. up to 3 in. long, 1s. lb.; ¾ in. dia. up to 3½ in. long, 11d. lb.; ½ in. dia. up to 2½ in. long, 62s. 6d. 100 lbs.; ¾ in. dia. up to 2½ in. long, 60s. 100 lbs.; ¾ in. dia. up to 2½ in. long, 55s. 100 lbs.; ¾ in. dia. up to 2½ in. long, 52s. 6d. 100 lbs.; ¾ in. dia. up to 2½ in. long, 52s. 6d. 100 lbs.; ¾ in. dia. up to 2½ in. long, 50s. 100 lbs.; ¾ in. and 1 in. dia., same

price as ¾ in. diameter; nuts, ¾ in., 10d. lb., ½ in., 60s., ¾ in., 57s. 6d., 1½ in., 1¼ in., 62s. 6d., 2 in., up, 67s. 6d.; washers, all sizes, 45s.; rivets, 3-16 in., 1s. 1d. lb., ½ in., 5-16 in., 10½ d., 7-16 in., ¾ in., 7½ d., ½ in., 45s., ¾ in., 42s. 6d., ¾ in. up, 40s. lb.; shoes and dies, 32s. 6d. to 35s. per 100lb.; rails, £23 per ton; picks, 4lbs., 27s. per doz.; shovels, 32s. 6d. to 50s. per dozen; drill hammers, 5½ d. lb. to 6d. lb.; hammer handles (best American), 14 in., 3s. 6d., 24 in., 7s., 30 in., 9s. 6d., 36 in., 13s., per dozen; metal, anti-friction, 1s. per lb.; galvanised iron, 24 gauge, 6 ft. to 10 ft., 10½ d., 11 ft. 11d., 12 ft. 1s.; 26 gauge, 6 ft. to 8 ft., 8½ d.; 9 ft. and 10 ft., 9d.; flat galvanised, 18 to 24 gauge, 35s. to 39s.; 26 gauge, 36s. 6d. 100 lbs.; floor brads, 36s.; ceiling, 40s.; wire nails, 37s. 6d. to 55s. per 100 lbs.; solder, 50 per cent., 1s. 3d. per lb.; locks, rim, 48s.; mortice, 60s. dozen; barbed wire, 26s. to 30s. 100 lb. coil.

Timber: Deals, Baltic, 9 x 3, short and medium, 1s. 1½ d.; longer lengths, 1s. 2½ d. to 1s. 3d. (Oregon, 1s. 1d.); flooring, 4½ x ¾ and 6 x ¾, 6½ d. to 6¾ d. per sq. ft.; do., 4½ x 1½, 9d.; and 6 x 1½, 9d.; ceilings, 6 x ½, 3½ d. to 3¾ d. per sq. ft.; Oregon, 4 x ½, 4½ d.; pitch pine, 8s. per cub. ft.; Oregon, 5s. 9d. to 6s. per cub. ft.; clear pine, ½ in. x 12 in., 7½ d. per ft.; 1 in. x 12 in., 8½ d.; teak, small planks, 14s. 9d. per cub. ft.; do., large, 15s. 6d.; jarrah, 9s. 6d. per cub. ft.; poplar, 1 in. x 12 in., 10d.; scantling, 1s. 1d. to 1s. 2d. per ft., 3 x 9.

Bricks, cement, lime, etc.: Cement, nominal, 31s. 6d. per cask; Pretoria Portland, 9s. 3d. per bag; 8s. 3d., truck loads; lime, white, 7s. 9d.; truck loads, 6s. 9d.; slaked, do., 5s.; blue, 3s. 3d.; plaster lime, 4s.; bricks, stock, delivered, 37s. 6d. to 45s.; wire cuts, 50s. to 70s., pressed 70s. to 80s. per 1,000, road transport difficult to obtain; salt and white glazed bricks, £27 10s. per 1,000; tiles, roofing, £17½ square; glazed tiles, 10s. 6d. to 17s. 6d. yard; paving cement tiles, 8s. 6d. yard laid; terra cotta tiles, £15 per 1,000; reinforced concrete columns, 6 ft. plain, 22s. 6d., fluted, 24s.; fireclay bricks, £9½, good average, per 1,000; clay chimney pots, 80s. per doz.; fire clay, 37s. 6d. ton on rail.

Oils, paints, lead, oxides, glass: Linseed, raw 30s.; boiled, 30s. per 5 galls.; white lead, 70s. to 72s. 6d. 100 lbs.; turpentine, 51s. 2½ galls.; 10/1, 57s.; coal tar, imported, 10s. to 12s. 6d. per 5 galls.; oxide in oil, 36s. per 100 lbs.; dry oxide, 21s. to 22s. 6d.; S.A. crude oxide, 12s. 6d.; linseed oil putty, 4s. 6d. per 12½ lbs.; bladders, 36s. casks of 100lbs.; grease A.F. axle, 23s. 6d. to 25s. per 100 lbs.; tallow, 1s. per lb.; White Rose paraffin, 17s. 3d. 2/5; Laurel do., 17s.; petrol, 27s. 6d. 2/4; motor oil, 6s. to 7s. 9d. per gall.; engine lubricating oils, 23s. to 36s. 6d. per case; cylinder, 25s. to 40s.; paints in tins, 10d. to 1s. per lb., according to quantity, and if ordered to be mixed, 20 per cent. on pre-war rates. British plate-glass, ¼ in., 3s. 6d.; do., mirror, 4s. 6d.; window, 16oz., 1s. to 1s. 3d. foot.

Chemicals: Mercury, £21½ per 75 lb. bottle; bichromate potash, 3s. 6d. lb.; chlorate, 2s. 6d. lb.; permanganate, 10s. 6d. lb.; alum, 4d. lb.; carbolic acid, 6s. 6d. lb.; borax, 87s. 6d. 100 lbs.; cyanide soda, 1s. 5d. lb.; hypo, 9d. lb.; acetate lead, 70s. 100 lbs.; litharge (assay), 70s. (commercial), 55s. 100 lbs.; zinc sheets and blocks, 1s. 6d. lb.; plumbago crucibles, 5d. per number.

Electrical Goods: Lamps, high volts., British, Holland & American, 16s. to 21s. wholesale, and 21s. to 27s. dozen, retail; carbon lamps, 7s. 6d. per dozen; pure rubber flex, 5d. to 6d. per yard; 3/20 coils of wire, 25s.; do., 3/22, 21s. 6d.; tubing, 13s. to 14s. 100 ft.; keyholders, 4s. 6d. to 5s. each; round blocks, 3½ in., 3s. 6d. doz.; lamp holder cord grips, 13s. 6d. to 14s. 6d. doz.; switches, 5 amp., 13s. to 14s. doz.; British glass shades, 24s. to 36s. doz.; Bohemian shades finished; porcelain shackles, 14s. 6d. doz.; do., bobbins, 9s. 6d. to 10s. per 100; cleats, 18s. per 100; P.O. insulators, 18s.; motor, 3 h.p., about £30 to £35, new.

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## RHODESIA CHAMBER OF MINES REPORT.

THE report of the Executive Committee of the Rhodesia Chamber of Mines for the month of November, 1916, has the following, *inter alia*:—The Commissioner selected by the British Board of Trade to conduct the forthcoming enquiry into railway matters in Southern Rhodesia is Mr. W. M. Acworth, the well-known authority on railways. Mr. Acworth, who is at present investigating railway matters in Canada, is expected to arrive in Rhodesia about the end of March next. The Railway Commission Committee in charge of the case for the public have been in communication with several railway experts and have been successful in securing the services of Mr. G. T. Dowling, of Cape Town, who has undertaken the work of preparing the case. Mr. Dowling will arrive in Bulawayo on the 5th January next, and arrangements are being made for him to interview the various public bodies of the country. The Committee are also in negotiation with an eminent barrister, who has a special knowledge of railway matters, with a view to the proper representation of the case before the Commissioner. Legal opinion has been taken in regard to water rights possessed by claimowners, and briefly stated is as follows: Under Section 73 of the Mining Law the registered owner of a mining location has the right to peg a site on any land open to prospecting in the vicinity of his location for the purpose of obtaining water for his mining purposes by sinking wells thereon. If there is no satisfactory site in the vicinity of the location, the owner may obtain a site for this purpose elsewhere on the grant of the Secretary for Mines under the same section. The Committee had under consideration the very high prices of mealies at present ruling in the country, and it was agreed to request H.H. The Administrator to institute an enquiry into the matter to ascertain if the present prices were in any way warranted,

and also to find out what stocks were actually being held throughout the country. It was felt very strongly that no permit for any further export of mealies should be allowed by the Government unless an assurance could be given that there is not likely to be any shortage in this country. It was brought to the knowledge of the Committee that the fees charged for native patients at the Belingwe Hospital were at the rate of 5s. per diem, as compared with 2s. 6d. per diem at other Government hospitals. There is a very large number of natives employed on the mines in Belingwe district, and as the Committee considered that the rate charged at the hospital in question was altogether too high, and that the mineowners in that district should not be subject to a higher charge than 2s. 6d. per diem for their native employees, it was decided to approach the Secretary for Mines on the subject with the view of bringing about a more satisfactory state of affairs. Mr. S. H. Boright has been appointed the representative of the Lonely Gold Mining Co., Ltd., vice Mr. Geo. Rich. Mr. S. H. Boright has been appointed alternate for Mr. C. B. Kingston on the Executive Committee. Mr. R. H. Urnson has resigned from the Committee as alternate for Mr. Theo. Haddon. The Bell Reef Development Co., Ltd., notified its intention of withdrawing from membership on the 31st December.

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## Engineering Notes and News.

### ELECTRICAL SYSTEM OF THE RAND POWER COMPANIES, WITH SPECIAL REFERENCE TO METHODS OF OPERATION AND EXPERIENCE.—VII.

[By BERNARD PRICE, M.I.E.E., Assoc.M.Inst.C.E., Past-President, S.A.I. of E.E.]

**Busbar Fault at Generating Station or Step-down Station.**—The d.t.l.o. relays on transmission lines and step-down transformers have time lags sufficiently greater than those of the relays on the distribution lines at points of output to ensure discrimination for all faults on the distribution networks. The relative setting of the time lags of the former relays is determined by the manner in which it is desired that the 40,000 volt system shall sectionalise itself in the event of a busbar fault at a generating station or step-down station. A fault of this nature is a serious matter as it must involve the loss of output from generating plant at the station which is in trouble. The effect upon supply may, however, be considerably reduced by dividing the generating capacity at the various stations between the two sets of busbars installed, these busbars being then coupled together through an interconnecting switch arranged to perform functions similar to those of the sectionalising switches on the distribution networks. This sectionalisation of the generating stations themselves is frequently resorted to, especially at times when lightning is anticipated.

**Fault on a Generator or Step-up Transformer.**—A fault on a generator or its transformer will be instantaneously isolated by the differential gear and/or neutral relay. When the plant first went into commission the generators were equipped with reverse power relays (in addition to the differential system) presumably for the purpose of isolating the machine automatically in the event of loss of excitation. Experience has shown, however, that it is preferable to rely upon hand isolation in all cases of excitation trouble, firstly, because reverse power relays are apt to operate when a heavy fault current is suddenly thrown upon the system and, secondly, because no serious consequence ensues from the somewhat longer time-lag which hand operation entails. The essential condition is that each generating unit shall hold on to supply unless its own a.c. circuits have broken down, and this is best met by relying upon the discriminating properties of differential relays. The d.t.l.o. relays on generating units are set to operate at a relatively high overload with relatively long time-lag, and are only intended to operate under the extreme condition of a fault on the local busbars. To illustrate the efficacy of the methods of protection above described, a summary of the operating experience in regard to all faults which have occurred during the year 1915 and during the first ten months of 1916 is given below.

#### INTERRUPTIONS DUE TO CONSUMERS' FAULTS.

	10 months	
	1915.	1916.
Total number	50	24

The cutouts discriminated correctly, with six exceptions, three of these being due to the use of overload relays without differential protection on unimportant lines feeding minor consumers, the other three being due to a transformer switch failing to open when the relay operated.

\*From Journal of the S.A.I. of E.E. Diagrams and references thereto have to be omitted.

#### SUB-STATION TRANSFORMER FAULTS.

	10 months	
	1915.	1916.
Transformer winding breakdowns	6	4

Discrimination was perfect in all cases, excepting one in which the fault was a severed terminal connection, and therefore did not cause a fault current to flow. In addition to the above, there were three instances where a healthy transformer was isolated unnecessarily due to deterioration of fuses in the differential circuit enabling a peak of the load to operate the relay.

#### SUB-STATION BUSBAR FAULTS.

	10 months	
	1915.	1916.
Flash-overs on busbar connections	2	2
Flash-overs due to pigeons	1	0
Flash-overs due to a rat	0	1
Overheating of main L.T. connection to consumer	0	1
	3	4

Discrimination was perfect with one exception where a switch failed to open when the relay had operated.

(Continued on next page.)

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OVERHEAD DISTRIBUTION LINE FAULTS.

	10 months	
	1915.	1916.
Damaged insulators ... ..	17	9
Birds ... ..	2	5
Broken guard wire ... ..	2	1
Broken binding wire at insulator ...	2	—
Flash-over to ironwork at sub-station entrance ... ..	1	—
Flash-over between phases at sub-station entrance ... ..	—	2
Arc from adjacent circuit ... ..	—	1
Tree falling on line ... ..	2	—
Blasting in proximity of line ... ..	1	—
Broken stay wire fouling line ... ..	1	—
Sleet ... ..	1	—
Cable end-box failure (Brakpan arrester yard) ... ..	—	1
Line down ... ..	—	3
Small boy climbing mast ... ..	—	1
Monkey climbing mast ... ..	1	—
No damage discovered though fault known to have existed ... ..	32	40
Total number of isolations ... ..	62	66

Discrimination was perfect with the following exceptions and for the reasons stated:—

	10 months	
	1915.	1916.
Switch failed to open when relay operated ... ..	2	1
Imperfect discrimination between overload relays on sections not equipped with differential relays	1	2
Inaccurate balance in differential circuit ... ..	1	2
Fault current insufficient to operate relays ... ..	—	2
	4	7

In addition to the above healthy lines were isolated unnecessarily on four occasions due to the following causes:—

	10 months	
	1915.	1916.
Incorrect arrangement of connections in differential circuit ... ..	1	—
Faulty pilot cable ... ..	2	—
Faulty relay ... ..	1	—
	4	Nil.

In two of these cases discrimination was imperfect due to defective relays.

40,000 VOLT TRANSMISSION LINE FAULTS.

	10 months	
	1915.	1916.
Damaged insulators ... ..	10	9
Birds ... ..	—	2
Broken guard wire ... ..	4	5
Conductor fouling guard net ... ..	—	1
Flash-over to ironwork at station entrance ... ..	1	—
Arc from adjacent circuit ... ..	1	—
Tree falling on line ... ..	1	—
Piece of wire thrown over lines ... ..	1	—
No damage discovered though fault known to have existed ... ..	36	16
Total number of isolations ... ..	54	33

In the following instances (included above) the discrimination was not perfect for the reasons stated:—

	10 months	
	1915.	1916.
Switch failed to open when relay operated ... ..	3	0
Imperfect discrimination of overload relay when differential relays were temporarily out of service...	1	0
Faulty relay ... ..	1	1
Differential relay out of service and no overload relay installed to take its place ... ..	1	0
	6	1

In addition to the above, healthy lines were isolated unnecessarily on two occasions due to inaccurate balance in the differential circuit.

(To be continued.)

British Industries Fairs, 1917.

This fair, which, as in 1915 and 1916, is being organised by the Board of Trade, will be held in the buildings of the Victoria and Albert Museum, South Kensington, London, S. W., from February 26th to March 9th, 1917, and will comprise the following trades, viz.:—Toys and games, earthenware and china, glass, fancy goods, stationery and printing. The British Industries Fair (Glasgow), 1917, which is being organised by the Corporation of the City of Glasgow under the auspices and with the support of the Board of Trade, will be held in Glasgow from February 26th to March 10th, 1917, and will comprise the following trades: Textiles, ready-made clothing, boots and shoes, foodstuffs (prepared and preserved), domestic chemicals. Tickets of admission to either of the above fairs can be obtained by merchants on their arrival in London by application to the Director of the British Industries Fair, Board of Trade, 32, Cheapside, London, E.C. The Board of Trade will provide an inquiry room at each of the above fairs for the purpose of furnishing commercial information. Interpreters will be placed at the disposal of foreign visitors free of charge at both fairs.

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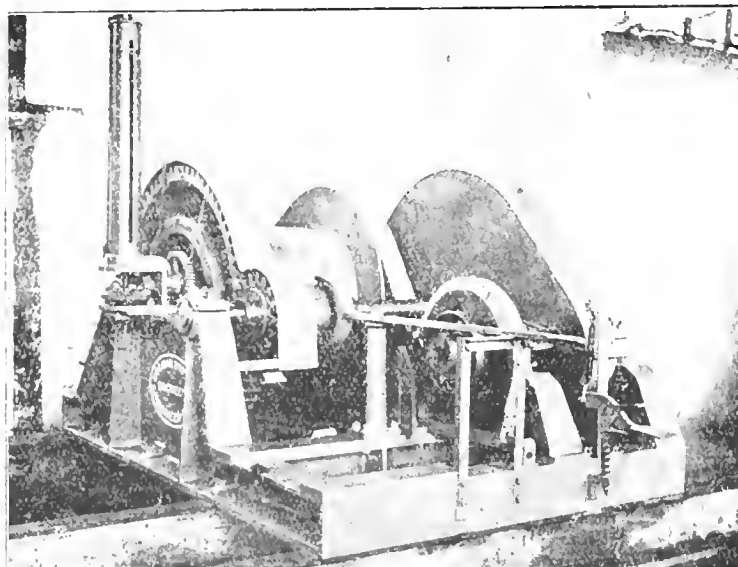
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